Clark Cant Hook Project
Environmental Assessment

Missoula Unit
Southwest Land Office
Montana Department of Natural Resources and Conservation
October 2016

Clark Cant Hook Project Environmental Assessment

Table of Contents

Clark Cant Hook Project

Environmental Assessment

Project Name: Clark Cant Hook Project
Proposed Implementation Date: June 2017
Proponent: Missoula Unit, Southwest Land Office, Montana DNRC
County: Missoula
Duration: 2017-2022

Type and Purpose of Action

Description of Proposed Action:

The Missoula Unit of the Montana Department of Natural Resources and Conservation (DNRC) is proposing forest management activities on 361 acres known as the Clark Cant Hook project. The project area is located approximately 14 miles west of Lolo Montana in the Clark Creek drainage, (refer to vicinity map Attachment **A-1** and project map **A-2**) and includes the following section:

Beneficiary	Legal Description	Total Acres	Treated Acres
Common Schools	**Section 16 T12N R22W**	**640**	**361**
Public Buildings			
MSU 2nd Grant			
MSU Morrill			
Eastern College-MSU/Western College-U of M			
Montana Tech			
University of Montana			
School for the Deaf and Blind			
Pine Hills School			
Veterans Home			
Public Land Trust			
Acquired Land			

The proposal includes timber harvest on approximately 361 acres removing an estimated 2 MMBF. In addition to timber harvest, the following table outlines all proposed activities under this EA:

Action	Quantity
Proposed Harvest Activities	
Sanitation/Salvage	361 acres
Total Treatment Acres	**361 acres**
Proposed Forest Improvement Treatment	
Pre-commercial Thinning	
Planting	~100 acres
Proposed Road Activities-DNRC Ownership	
New permanent road construction	2.1 miles
Road maintenance	6.1 miles
Road Reconstruction	.51 miles

Objectives of the project include:

- Return the stand to the Desired Future Condition (DFC) by promoting seral species.
- Maintain forest productivity by removing trees with poor form and/or vigor.
- Salvage Douglas-fir impacted by root rot and Douglas-fir beetles
- Generate revenue for the Common School Trust

The lands involved in this proposed project are held in trust by the State of Montana. (Enabling Act of February 22, 1889; 1972 Montana Constitution, Article X, Section 11). The Board of Land Commissioners and the DNRC are required by law to administer these trust lands to produce the largest measure of reasonable and legitimate return over the long run for the beneficiary institutions (Section 77-1-202, MCA).

The DNRC would manage lands involved in this project in accordance with:

- The State Forest Land Management Plan (DNRC 1996),
- Administrative Rules for Forest Management (ARM 36.11.401 through 471),
- The Montana DNRC Forested State Trust Lands Habitat Conservation Plan (HCP) (DNRC 2010)
- All other applicable state and federal laws.

Project Development

SCOPING:

- DATE:
  - January 9, 2015
- PUBLIC SCOPED:
  - The scoping notice was posted on the DNRC Website: http://dnrc.mt.gov/public-interest/environmental-docs
  - Adjacent landowners, agencies and tribes were scoped.
  - A notice was placed in the Missoulian in January of 2015.
- EXTERNAL COMMENTS RECEIVED:

- A letter from the Confederated Salish and Kootenai Tribes indicated that they are unaware of any cultural sites in the project area. If a cultural site is discovered they would like to be notified.
- A letter from Lance Nelsen, an adjacent landowner, is concerned about wildlife in the area, "virgin forests" on the DNRC parcel and past harvests on parcels surrounding DNRC ownership.
- A letter from Guy Leibenguth, an adjacent landowner, is concerned about wildlife in the area.
- A phone call from Paul Rossignol, an adjacent landowner, voicing his support for the timber sale. As an adjacent landowner he was glad to see DNRC propose treatment of overstocked stands.

- DNRC RESPONSE:
  - If a site with cultural significance was discovered during project implementation all work would be halted and the DNRC Archeologists as well as the tribe would be notified immediately.
  - DNRC replied to Mr. Nelsen in February of 2015 (The letter as well as the DNRC response will be made available upon request). In addition, an invitation for a field tour to look at the proposed prescription and transportation plan was sent in September, 2016.
  - DNRC replied to Mr. Leibenguth in February of 2015 (The letter as well as the DNRC response will be made available upon request). In addition, an invitation for a field tour to look at the proposed prescription and transportation plan was sent in September, 2016.
  - DNRC discussed the proposal with Mr. Rossignol.

Internal and external issues and concerns were incorporated into project planning and design and will be implemented in associated contracts.

INTERDISCIPLINARY TEAM (ID):

- Project Leader: Amy Helena
- Archeologist: Patrick Rennie
- Wildlife Biologist: Garrett Schairer
- Hydrologist & Soil Scientist: Jeff Collins
- Decision Maker: Jonathan Hansen

OTHER GOVERNMENTAL AGENCIES WITH JURISDICTION, LIST OF PERMITS NEEDED: *(Conservation Easements, Army Corps of Engineers, road use permits, etc.)*

- **United States Fish & Wildlife Service-** DNRC is managing the habitats of threatened and endangered species on this project by implementing the Montana DNRC Forested Trust Lands Habitat Conservation Plan (HCP) and the associated Incidental Take Permit that was issued by the United States Fish & Wildlife Service (USFWS) in February of 2012 under Section 10 of the Endangered Species Act. The HCP identifies specific conservation strategies for managing the habitats of grizzly bear, Canada lynx, and three fish species: bull trout, westslope cutthroat trout, and Columbia redband trout. This project complies with the HCP. The HCP can be found at www.dnrc.mt.gov/HCP

- **Montana Department of Environmental Quality (DEQ) -** DNRC is classified as a major open burner by DEQ and is issued a permit from DEQ to conduct burning activities on

state lands managed by DNRC. As a major open-burning permit holder, DNRC agrees to comply with the limitations and conditions of the permit.

A Short-term Exemption from Montana's Surface Water Quality Standards (318 Authorization) may also be required from DEQ if activities such as replacing a bridge on a stream would introduce sediment above natural levels into streams.

- **Montana/Idaho Airshed Group-** The DNRC is a member of the Montana/Idaho Airshed Group which was formed to minimize or prevent smoke impacts while using fire to accomplish land management objectives and/or fuel hazard reduction (Montana/Idaho Airshed Group 2006). The Group determines the delineation of airsheds and impact zones throughout Idaho and Montana. Airsheds describe those geographical areas that have similar atmospheric conditions, while impact zones describe any area in Montana or Idaho that the Group deems smoke sensitive and/or having an existing air quality problem (Montana/Idaho Airshed Group 2006). As a member of the Airshed Group, DNRC agrees to burn only on days approved for good smoke dispersion as determined by the Smoke Management Unit.

- **Montana Department of Fish, Wildlife and Parks (DFWP) -** A Stream Protection Act Permit (124 Permit) is required from DFWP for activities that may affect the natural shape and form of a stream's channel, banks, or tributaries.

- **United States Forest Service (USFS) -** DNRC has requested a temporary road use permit from the USFS to access the sale area.

ALTERNATIVES CONSIDERED:

No-Action:
Under the No-Action alternative the following stand conditions would persist:

- Root rot would continue to cause mortality across all age classes of Douglas-Fir.

- Douglas-fir beetle mortality would continue across all size and age classes in Douglas-fir.

- Douglas-fir would continue to outcompete seral species causing an overall reduction in species that were historically present in the area.

- Increased fuel loading both on the ground and as ladder fuels would increase the likelihood of a crown fire and mortality across all species and age classes.

- Overall stand growth and vigor would continue to be suppressed due to overstocked stands.

- No revenue would be generated for the Common Schools Trust in the project area.

Action Alternative:

- DNRC would harvest approximately 2 MMBF from approximately 361 acres using a sanitation/salvage prescription. This prescription would harvest dead and dying timber, as well as timber exhibiting poor form and limited growth. Ground based and excaline harvest systems would be utilized. Slash would be piled and burned postharvest.

- Planting activities may take place postharvest if natural regeneration does not occur.

- New road construction and road maintenance activities would also take place to access the DNRC parcel and bring existing roads up to BMP standards.

Impacts on the Physical Environment

VEGETATION:

Issues and Concerns- The following issue statements were developed during scoping regarding the effects of the proposed action to vegetation:

- Timber harvesting and road building may introduce or spread noxious weeds in the project area.

- Forest management activities may adversely affect Old Growth.

- Root rot may continue to cause mortality in the overstory if no treatment takes place.

- Shade tolerant species would continue to outcompete seral species preventing stands from maintaining their historic cover type and species distribution.

- Stands are currently overstocked.

Issues dismissed from further review

- *There is concern the proposed project could negatively impact populations of threatened, endangered, or sensitive plant species.*

This issue has been dismissed from further study because no rare plants have been identified within the project area through field surveys or a search of the Montana Natural Heritage Program. Therefore, no direct, indirect, or cumulative impacts to rare plants would be expected under either alternative.

Recommended Mitigation Measures for Vegetation- The analysis and levels of effects to vegetation resources are based on implementation of the following mitigation measures.

- When selecting leave trees, favor western larch and ponderosa pine to limit effects of root rot in the project area.

- If natural regeneration does not occur, plant western larch or ponderosa pine in root rot infected areas to convert stands to a resistant species.

- Conduct Old Growth maintenance treatments to maintain Old Growth on the landscape.

- Wash equipment prior to entering the harvest area to limit weed seed dispersal.

- Spray weeds along roadsides to control and limit spread of existing weeds.

- Plant grass on newly disturbed road surfaces to limit the area available for weeds to become established.

Recommended Mitigations and Adjustments of Harvest Treatments for the Benefit of Other Resources

- *Snags, snag recruits, and coarse woody debris would be managed according to *ARM 36.11.411* through *36.11.414*, particularly favoring western larch. Clumps of existing snags would be maintained where they exist to offset areas without sufficient snags. Coarse woody debris retention would emphasize retention of downed logs of 15-inch diameter or larger.

FOR COMPLETE VEGETATION ANALYSIS SEE ATTACHMENT B

WILDLIFE ***(terrestrial & avian including unique, federally listed as threatened or endangered, sensitive, and/or species of special concern):***

Issues and Concerns- The following issue statements were developed during scoping regarding the effects of the proposed action to wildlife:

- Proposed activities could alter mature forested habitats and/or landscape connectivity, which could affect species that rely on these mature forested habitats, and/or alter connectivity and the ability of wildlife requiring corridors to move through the landscape.

- Proposed activities could negatively affect Canada lynx by altering lynx winter foraging habitat, summer foraging habitat, and other suitable habitat, rendering these habitats unsuitable for supporting lynx.

- Proposed activities could reduce the amount and/or quality of fisher habitats, which could alter fisher use of the area.

- Proposed activities may alter flammulated owl habitat by reducing canopy closure and increasing tree spacing, and could remove snags needed by flammulated owls for nesting.

- Proposed activities could displace gray wolves from important habitats, particularly denning and rendezvous sites, and/or alter prey availability.

- Proposed activities could reduce suitable nesting and foraging habitat for pileated woodpeckers, which could alter pileated woodpecker use of the area.

- Proposed activities could disturb nesting red-tailed hawks and/or modify nesting habitats for red-tailed hawks.

- Proposed activities could remove forest cover on big game winter range, which could reduce the carrying capacity of the winter range.

- Proposed activities could remove big game security cover, which could affect hunter opportunity and local quality of recreational hunting.

Recommended Mitigation Measures for Wildlife- The analysis and levels of effects to wildlife are based on implementation of the following mitigation measures.

- A DNRC biologist would be consulted if a threatened or endangered species is encountered to determine if additional mitigations that are consistent with the administrative rules for managing threatened and endangered species (ARM 36.11.428 through 36.11.435) are needed.

- Motorized public access would be restricted at all times on restricted roads that are opened for harvesting activities; signs would be used during active periods and a physical closure (gate, barriers, equipment, etc.) would be used during inactive periods (nights, weekends, etc.). After the project is finished roads and skid trails would be reclosed to reduce the potential for unauthorized motor vehicle use.

- Snags, snag recruits, and coarse woody debris would be managed according to *ARM 36.11.411* through *36.11.414*, particularly favoring western larch and ponderosa pine. Clumps of existing snags could be maintained where they exist to offset areas without sufficient snags. Coarse woody debris retention would emphasize retention of downed logs of 15-inch diameter or larger.

- Contractors and purchasers conducting contract operations would be prohibited from carrying firearms while working.

- Food, garbage, and other attractants would be stored in a bear-resistant manner.

- Retention of patches of advanced regeneration of shade-tolerant trees, such as sub-alpine-fir and spruce, in units in lynx habitats would break-up sight distances, provide horizontal cover, and provide forest structural attributes preferred by snowshoe hares and lynx.

- Provide connectivity for fisher, Canada lynx, and a host of other species by maintaining corridors of unharvested and/or lighter harvested areas along riparian areas, ridge tops, and saddles.

- Retain red-tailed hawk nest tree and several perch trees within 100 yards of the nest (located in the northeastern portion of unit 2). In any year when the nest is active, restrict harvesting within 0.25 miles of the nest to the non-nesting period (August 1 – April 1) to minimize potential for disturbing the nesting pair.

FOR COMPLETE WILDLIFE ANALYSIS SEE ATTACHMENT C

SOILS:

Issues and Concerns- The following issue statements were developed during scoping regarding the effects of the proposed action to soils:

- There is a concern that forest management activities may result in increased erosion and reduced soil productivity where excessive disturbance from compaction, displacement, or loss of nutrients occurs, depending on the extent and degree of harvest related soil effects.

Recommended Mitigation Measures for Soils- The analysis and levels of effects to soils resources are based on implementation of the following mitigation measures.

- DNRC would implement all applicable BMPs, Montana Administrative Rules for Forest Management, and reasonable mitigation and erosion control practices during timber harvest, road maintenance, and road construction and road use activities. The commitments of the DNRC Habitat Conservation Plan (HCP) would be implemented.

- Limit harvest equipment and hauling operations to periods when soils are relatively dry, (less than 20% soil moisture), frozen or snow covered to minimize soil compaction and rutting, and maintain drainage features. Check soil moisture conditions prior to equipment start-up.

- On tractor harvest units, the logger and sale administrator would agree to a general skid-ding plan prior to equipment operations to limit trails to 15% or less of the harvest unit. Feller-bunchers may work on slopes up to 45% as long as soil displacement and turning is minimized to prevent excessive soil disturbance. Slopes over 45% would be cable harvested to reduce soil impacts and improve harvest efficiency.

- Whole tree skidding can reduce slash hazard, but also remove a portion of nutrients from growing sites. Target fine slash and woody debris levels are 5-15 tons/acre well distributed on the harvest site, while meeting the requirements of the slash law. On sites with lower basal area, retain large woody debris as feasible since it may not be possible to retain 5 tons/acre and the emphasis would be on providing additional coarse woody debris (CWD) in the future. Slash may be placed on main skid trails to protect soils and reduce erosion potential.

- Existing road segments would be improved and maintained in association with the harvest activities. Road improvements would include surface blading and installation of drainage features to control surface erosion and prevent sediment delivery to streams as needed to comply with BMPs and to protect water quality.

- Harvest operations and road conditions would be monitored as part of the on-going project operations and repairs would be made as needed, including erosion control, culvert cleaning and re-vegetation. If cut-slope or fill-slope slumps occurred on new roads they would be stabilized to control erosion as part of the harvest project.

- New road construction, including drainage features should be completed prior to freezing conditions. Road cutslopes are to be constructed at relatively stable angles as noted in the contract.

FOR COMPLETE SOILS ANALYSIS SEE ATTACHMENT D

WATER RESOURCES:

Issues and Concerns- The following issue statements were developed during scoping regarding the effects of the proposed action to water resources:

- Water Quality - There is a concern that the proposed action may cause impacts to water quality and quantity from timber management, road construction, and road use.

- Cumulative Watershed Effects- There is a concern that the proposed timber harvest may cause or contribute to cumulative watershed impacts as a result of potential increased runoff and sedimentation.

FISHERIES RESOURCES *(including unique, federally listed as threatened or endangered, sensitive, and/or species of special concern):*

Issues and Concerns- The following issue statements were developed during scoping regarding the effects of the proposed action to fisheries resources:

- Cold Water Fisheries-There is a concern the proposed forest management actions may have effects to fisheries due to sediment delivery to streams.

- Fisheries Connectivity- There is a concern that an existing stream crossing within the project area may restrict fish passage.

Recommended Mitigation Measures for Water Resources & Fisheries- The analysis and levels of effects to water resources and fisheries resources are based on implementation of the following mitigation measures.

- DNRC would implement all applicable Best Management Practices (BMPs), Montana Administrative Rules for Forest Management, and reasonable mitigation and erosion control practices during timber harvest, road maintenance, road construction and road use activities. The commitments of the DNRC Habitat Conservation Plan (HCP) would be implemented on the applicable parcels.

- DNRC would locate, clearly mark and maintain suitable water resource protection boundaries including Streamside Management Zones (SMZ's), Riparian Management

Zones (RMZ's) and Wetland Management Zones (WMZ's) adjacent to streams and wetlands consistent with State Forest Land Management Rules and the HCP.

- DNRC would retain trees in the RMZ'S and SMZ's that meet the minimum tree retention requirements of the SMZ Law.

- Mitigations to reduce soil impacts and control erosion on skid trails and cable corridors would be implemented to protect water quality including limiting harvest and hauling operations to periods when soils are relatively dry, (less than 20% soil moisture), frozen or snow covered to minimize soil compaction and rutting, and maintain drainage features.

- Existing and new roads would be maintained concurrently in association with the harvest and road use activities. Road improvements would include surface blading, rock armoring of culvert inlets, and installation of road drainage features to prevent surface erosion and sediment delivery to streams as needed to comply with BMPs, and to protect water quality.

- All culvert replacements would be completed in accordance with all BMPs and FWP 124 stream permit requirements. Replacement of stream crossings on fish bearing streams would be installed to provide adequate passage of fish with minimum impact to water quality. Site specific erosion control measures including slash filters, and grass seeding will be implemented during culvert replacements and perennial flows would be diverted from the culvert during construction.

- New road construction, including drainage features should be completed in the summer or fall prior to freeze-up or periods of expected high rainfall.

- All newly disturbed soils on road cuts and fills would be promptly reseeded to site adapted grasses to reduce erosion/sediment from roads.

FOR COMPLETE WATER & FISHERIES RESOURCES ANALYSIS SEE ATTACHMENT E

AESTHETICS

Any change to the scenery in the area from these alternatives would be in addition to past activity within the project area. This analysis includes all past and present effects.

Existing Conditions

Depending on the access point, the project area is approximately 4-6 miles behind locked gates and cannot be observed from an open road or Highway.

Three sides of the project area border current and previously managed industrial timberland. These areas have received even age management treatments over several entries. This past management has resulted in well vegetated young stands 5-30 feet tall across the landscape. The western border is adjacent to a private landowner who actively manages timber in an uneven age management regime, resulting in a well-spaced overstory with limited amounts of overstocking. The project area consists of stands 30-100 feet tall, overstocked in the overstory and understory. This causes a stark visual contrast between ownerships across the landscape when observing the project area and surrounding sections.

-VISUAL QUALITY

No Action Alternative:
No harvest would take place. Section 16 would continue to have “hard edges” and a square appearance.

Action Alternative:

Direct, Secondary, and Cumulative Effects
The proposed activities would soften the edges along the ownership lines, which would allow the section to blend in more with the surrounding area.

Harvest units would be more open and slash from the harvest would be noticeable yet temporary.

The proposed Action Alternative would not be expected to have any direct, indirect, or cumulative effect based on the following:

- The project area is in a remote location and cannot be observed from a highway or open road.

- The proposed treatments would reduce the stocking along the ownership lines, which would soften the edge and blend the section in better with the surrounding landscape.

HISTORICAL AND ARCHEOLOGICAL SITES:

A Class I (literature review) level review was conducted by the DNRC staff archaeologist for the area of potential effect (APE). This entailed inspection of project maps, DNRC's sites/site leads database, land use records, General Land Office Survey Plats, and control cards. The Class I search results revealed that no cultural or paleontological resources have been identified in the APE on state land. No additional archaeological investigative work will be conducted in response to this proposed development.

No Action Alternative:
The no Action Alternative would not have any direct, indirect, or cumulative effects to these sites.

Action Alternative:
Under the proposed Action Alternative, if previously unknown cultural or paleontological materials are identified during project related activities, all work will cease until a professional assessment of such resources can be made.
Therefore, the proposed Action Alternative would not be expected to have any direct, indirect, or cumulative effect on historical or archaeological resources.

DEMANDS ON ENVIRONMENTAL RESOURCES OF LAND, WATER, AIR, AND ENERGY:

There would be no measurable direct, secondary, and cumulative impacts related to environmental resources of land, water, air, and energy due to the relatively small size of the timber sale project.

OTHER ENVIRONMENTAL DOCUMENTS PERTINENT TO THE AREA:

- State Forest Land Management Plan EIS, DNRC 1996, sets the strategy that guides DNRC management decisions statewide.

- USFWS and DNRC. 2010. Montana Department of Natural Resources and Conservation 'Forested Trust Lands Habitat Conservation Plan, Final Environmental Impact Statement, Volumes I and II. U.S. Department of Interior, Fish and Wildlife Service, Region 6, Denver, Colorado, and Montana Department of Natural Resources and Conservation, Missoula, MT. September 2010.

Impacts on the Human Population

HUMAN HEALTH AND SAFETY:

Air Quality

The DNRC is a member of the Montana/Idaho Airshed Group which was formed to minimize or prevent smoke impacts while using fire to accomplish land management objectives and/or fuel hazard reduction (Montana/Idaho Airshed Group 2006). The Group determines the delineation of airsheds and impact zones throughout Idaho and Montana. Airsheds describe those geographical areas that have similar atmospheric conditions, while impact zones describe any area in Montana or Idaho that the Group deems smoke sensitive and/or having an existing air quality problem (Montana/Idaho Airshed Group 2006).

The project area is located within Montana Airshed 3A, which encompasses Missoula County. Currently, this Airshed does contain impact zones; however the project area does not lie within the impact zone.

Issues and Concerns- The following issue statements were developed during scoping regarding the effects of the proposed action to air quality:

- Smoke would be produced during pile burning.

- Dust would be produced during harvesting and hauling activities.

Recommended Mitigation Measures for Air Quality- The analysis and levels of effects to air quality are based on implementation of the following mitigation measures:

- Burning would be limited to days that are approved by the Montana/Idaho Airshed group and DEQ.

- Conduct a test burn to verify good smoke dispersal.

- Dust abatement may be used as deemed necessary by the Forest Officer.
- Slower speed limits may be included in contracts as necessary to reduce dust.

-SLASH BURNING

No Action Alternative:
No slash would be burned within the project areas. Thus, there would be no effects to air quality as a result of the proposed activities within the local vicinity and throughout Airshed 3A.

Action Alternative:

Direct and Secondary Effects
Slash consisting of tree limbs, tops and other vegetative debris would be piled throughout the project area during harvesting. Slash would ultimately be burned after harvesting operations have been completed. Burning would introduce particulate matter into the local airshed, temporarily affecting local air quality.

Burning within the project area would be short in duration and would be conducted when conditions favor good to excellent ventilation and smoke dispersion as determined by the Montana Department of Environmental Quality and the Montana/Idaho Airshed Group. The DNRC, as a member of the Montana/Idaho Airshed Group, would burn only on approved days.

Thus, direct and secondary effects to air quality due to slash burning associated with the proposed action would be minimal.

Cumulative Effects
Cumulative effects to air quality would not exceed the levels defined by the State of Montana Cooperative Smoke Management Plan (1988) and managed by the Montana/Idaho Airshed Group. Prescribed burning by other nearby airshed cooperators (for example the U.S. Forest Service) would have the potential to affect air quality. All cooperators currently operate under the same Airshed Group guidelines. The State, as a member, would burn only on approved days. This should decrease the likelihood of additive cumulative effects. Thus, cumulative effects to air quality due to slash burning associated with the proposed action would also be expected to be minimal.

-DUST

No Action Alternative:
No increased dust would be produced as a result of the proposed timber sale. Current levels of dust would continue to be produced in the area.

Action Alternative:

Direct, Secondary, and Cumulative Effects:
Harvesting operations would be short in duration. Dust may be created from log hauling on portions of native surface roads during summer and fall months. Contract clauses may provide for the use of dust abatement or require trucks to reduce speed if necessary to reduce dust near any affected residences.

Thus, direct, secondary, and cumulative effects to air quality due to harvesting and hauling associated with the proposed action would be minimal.

RECREATION ***(including access to and quality of recreational and wilderness activities):***
The area is used for hiking, hunting, cross-country skiing, snowmobiling and general recreating. Currently, roads in the area are closed to motorized use and used only for administrative purposes. There would be no change in road closure status and the selection of either alternative would not affect the ability of people to recreate on this parcel.

There would be no change from existing conditions. Therefore, there would be no measurable direct, secondary, or cumulative impacts on recreation from this proposed action.

Would the No-Action or Action Alternatives result in potential impacts to:	Impact												Can Impact Be Mitigated?	Comment Number
	Direct				Secondary				Cumulative					
	No	Low	Mod	High	No	Low	Mod	High	No	Low	Mod	High		
No-Action														
Health and Human Safety	**X**				**X**				**X**					
Industrial, Commercial, and Agricultural Activities and Production	**X**				**X**				**X**					
Quantity and Distribution of Employment	**X**				**X**				**X**					
Local Tax Base and Tax Revenues	**X**				**X**				**X**					
Demand for Government Services	**X**				**X**				**X**					
Density and Distribution of Population and Housing	**X**				**X**				**X**					
Social Structures and Mores	**X**				**X**				**X**					
Cultural Uniqueness and Diversity	**X**				**X**				**X**					
Action														
Health and Human Safety		**X**				**X**				**X**			**yes**	**1**
Industrial, Commercial, and Agricultural Activities and Production	**X**				**X**				**X**					
Quantity and Distribution of Employment		**X**				**X**				**X**			**yes**	**2**
Local Tax Base and Tax Revenues	**X**				**X**				**X**					
Demand for Government Services	**X**				**X**				**X**					
Density and Distribution of Population and Housing	**X**				**X**				**X**					

Would the No-Action or Action Alternatives result in potential impacts to:	Impact												Can Impact Be Mitigated?	Comment Number
	Direct				Secondary				Cumulative					
	No	Low	Mod	High	No	Low	Mod	High	No	Low	Mod	High		
Social Structures and Mores	X				X				X					
Cultural Uniqueness and Diversity	X				X				X					

Comment Number 1:

Impact
Log truck traffic in the area would increase for the duration of the timber sale, which could cause a low impact to human safety.

Mitigations:

- Signs would be posted indicating that log truck traffic is present in the area.
- If necessary, a slower speed limit may also be imposed in the timber harvest contract.
- Log hauling would take place during the general "work week".

Comment Number 2:

Impact
According to the Montana Bureau of Business and Economic Research a general rule of thumb is that for every one million board feet of sawtimber harvested in Montana, ten person years of employment occur in the forest products industry.

This harvest is viewed as a continuation of a sustained yield and as such would not create any new jobs but rather sustain approximately 20 person years of employment in the forest products industry. A few short-term jobs would also be created/sustained by issuing a tree planting contracts following harvest. Additionally, local businesses, such as hotels, grocery stores, and gas stations would likely receive additional revenues from personnel working on the proposed project. This would be a positive low impact to quantity and distribution in the area.

Mitigations:

- This impact would be positive and mitigations would not be necessary.

LOCALLY ADOPTED ENVIRONMENTAL PLANS AND GOALS *(includes local MOUs, management plans, conservation easements, etc.):*

None

OTHER APPROPRIATE SOCIAL AND ECONOMIC CIRCUMSTANCES:

The proposed action has a projected harvest volume of 2 MMBF. This volume is worth approximately $391/MBF delivered to a forest products manufacturing site based on current market prices. Delivered to market, the proposed action has an estimated total revenue value of $782,000.

Costs related to the administration of the timber sale program are only tracked at the Land Office and Statewide level. DNRC does not track project-level costs for individual timber sales. An annual cash flow analysis is conducted on the DNRC forest product sales program.

Revenue and costs are calculated by land office and statewide. These revenue-to-cost ratios are a measure of economic efficiency. A recent revenue-to-cost ratio of the Trust Lands Program was 1:2.07. This means that, on average, for every $1.00 spent in costs, $2.07 in revenue was generated. Costs, revenues, and estimates of return are estimates intended for relative comparison of alternatives. They are not intended to be used as absolute estimates of return.

Currently, the Sustained yield and target harvest from Trust Lands is 56.9 MMBF, which represents approximately 16% of timber used by mills in Montana (Hayes 2016). This project would provide approximately 2 MMBF of timber towards the sustained yield target thus helping sustain current mill capacity.

Environmental Assessment Checklist Prepared By:

Name: Amy Helena
Title: Missoula Unit Forest Management Supervisor
Date: October 27, 2016

Finding

Alternative Selected
Alternative B-the Action Alternative

Significance of Potential Impacts

An interdisciplinary team (ID Team) has completed the Environmental Assessment (EA) for the proposed Clark Cant Hook Timber Sale prepared by the Montana Department of Natural Resources and Conservation (DNRC). After a review of the EA, project file, public correspondence, Department Administrative Rules, policies, and the State Forest Land Management Plan (SFLMP), I have made the following decisions:

ALTERNATIVE SELECTED
Two alternatives were presented and the effects of each alternative were fully analyzed in the EA:

Alternative A: Deferred Harvest (No Action Alternative)
Alternative B: Harvest (Action Alternative)

Alternative B proposes to harvest approximately 2,000,000 board feet of timber on 361 acres. Alternative A does not include the harvest of any timber. Subsequent review determined that the alternatives, as presented, constituted a reasonable range of potential activities.

For the following reasons, I have selected the Action Alternative without additional modifications:

The Action Alternative meets the Project Need and the specific project objectives as described on page 2 of the EA. The Action Alternative would produce an estimated total revenue value of $782,000, while providing a mechanism whereby the existing timber stands would be moved towards conditions more like those, which existed historically.

The analysis of identified issues did not disclose any reason compelling the DNRC to not implement the timber sale.

The Action Alternative includes mitigation activities to address environmental concerns identified during both the Public Scoping phase and the project analysis.

SIGNIFICANCE OF IMPACTS

For the following reasons, I find that the implementation of Alternative B will not have significant impacts on the human environment:

Soils-Leaving 5-15 tons of large, woody debris on site will provide for long-term soil productivity. Harvest mitigation measures such as skid trail planning and season of use limitations will limit the potential for severe soil impacts.

Water Quality-The Action Alternative would improve the surface drainage on existing roads, install culverts, clean ditches and clean culverts, thereby reducing the amount of current sedimentation within the project area. Water Quality Best Management Practices for Montana Forests (BMPs) and the Streamside Management Zone (SMZ) law will be strictly adhered to during all operations involved with the implementation of the Action Alternative.

Cumulative Watershed Effects-Estimated increases in annual water yield for the proposed action have been determined to be negligible by the DNRC Hydrologist. Increases in sediment yield are expected to be negligible due to the amount of area treated, location along the landscape, replacement and/or improvement of existing culverts and mitigations designed to minimize erosion.

Cold Water Fisheries- Due to planning and associated mitigation, it is unlikely that the proposed timber sale will affect large woody debris recruitment, shade or in-stream temperature in any fish-bearing streams within the project area.

Air Quality-Any slash burning conducted as part of the Clark Cant Hook Timber Sale will be conducted in coordination with the Montana/Idaho Airshed group in order to ensure that ideal smoke dispersion conditions exist prior to ignition and throughout the duration of any burning operations. As a result, impacts to air quality should be minor and short in duration.

Noxious Weeds-Equipment will be cleaned prior to entering the project area, which will reduce the likelihood of weed seeds being introduced onto treated areas. The DNRC will monitor the project area for two years after harvest and will use an Integrated Weed Management strategy to control weed infestations should they occur.

Forest Conditions and Forest Health-The proposed harvest will begin the process of returning the timber stands within the project area to those conditions that most likely existed on the site(s) prior to organized fire suppression.

Visual Quality-The limited amount of new permanent roads, a harvest prescription that leaves the largest, healthiest trees within treated stands, and minimizing the width of cable corridors when yarding steeper slopes will result in a minimal visual impact in the short term. The aesthetic quality of the project area should improve in the long term as trees remaining within treated stands increase in size and their crowns expand.

Wildlife-The proposed harvest operations present a minimal likelihood of negative impacts to Threatened and Endangered Species. Those potential impacts that do exist have been mitigated to levels within acceptable thresholds. The same is true for those species that have been identified as "sensitive" by the DNRC. The effects of the proposed action on Big Game species would be low to moderate.

Economics-The Action Alternative would provide an estimated total revenue value of $782,000 and does not limit the DNRC's options for generating revenue from this site in the future.

3. PRECEDENT SETTING AND CUMULATIVE IMPACTS-

The project area is located on State-owned lands, which are "principally valuable for the timber that is on them or for growing timber or for watershed" (**MCA 77-1-402**). The proposed action is similar to past projects that have occurred in the area. Since the EA does not identify future actions that are new or unusual, the proposed timber harvest is not setting precedence for a future action with significant impacts.

Taken individually and cumulatively, the identified impacts of the proposed timber sale are within established threshold limits. Proposed timber sale activities are common practices and none of the project activities are being conducted on fragile or unique sites.

The proposed timber sale conforms to the management philosophy adopted by DNRC in the SFLMP and is in compliance with existing laws, Administrative Rules, and standards applicable to this type of action.

4. SHOULD DNRC PREPARE AN ENVIRONMENTAL IMPACT STATEMENT (EIS)?

Based on the following, I find that an EIS does not need to be prepared:

The EA adequately addressed the issues identified during project development, and displayed the information needed to make the pertinent decisions.

Evaluation of the potential impacts of the proposed timber sale indicates that significant impacts to the human environment will not occur as a result of the implementation of the Action Alternative.

The ID Team provided sufficient opportunities for public review and comment during project development and analysis.

Need for Further Environmental Analysis

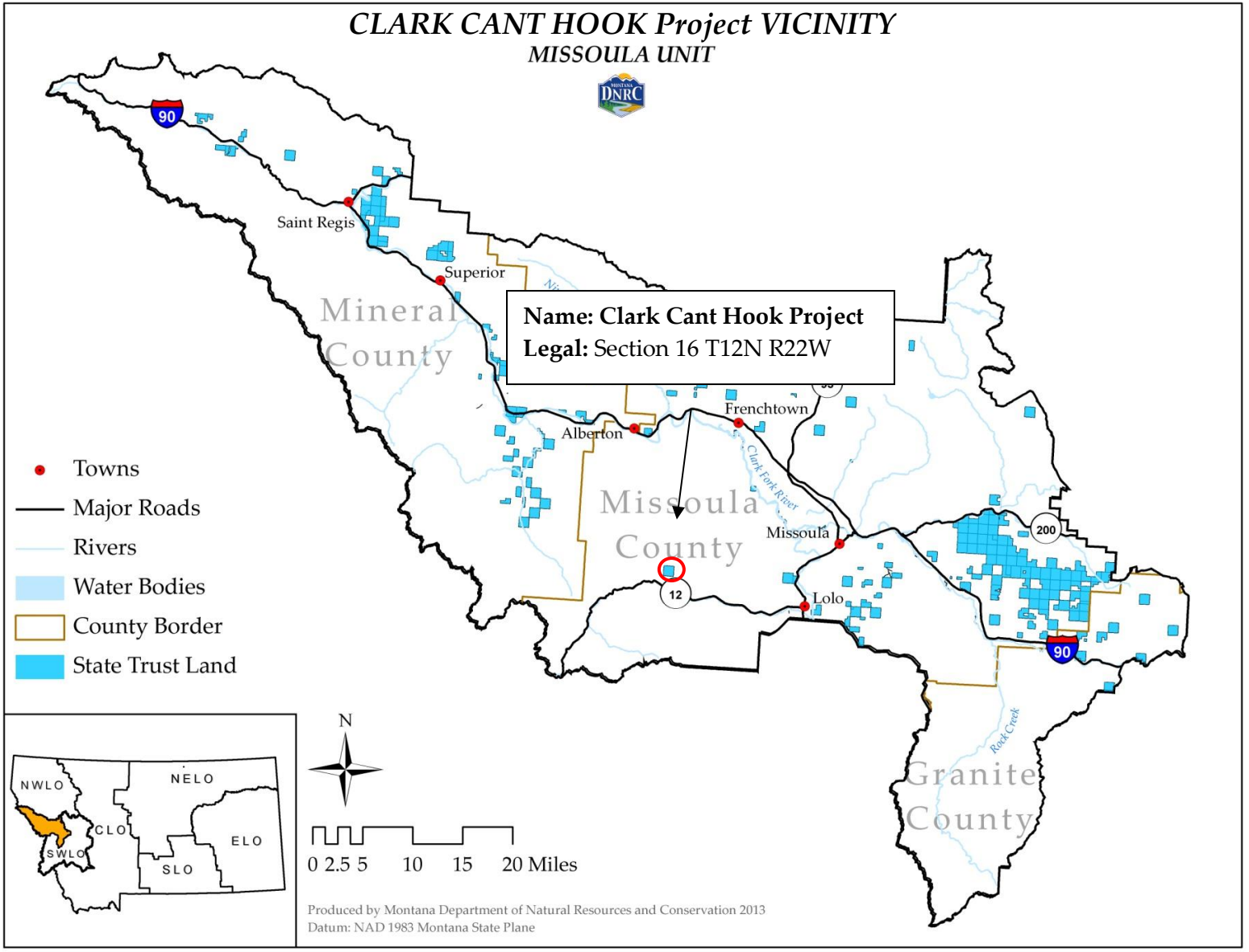
☐	EIS	☐	More Detailed EA	X	No Further Analysis

Environmental Assessment Checklist Approved By:

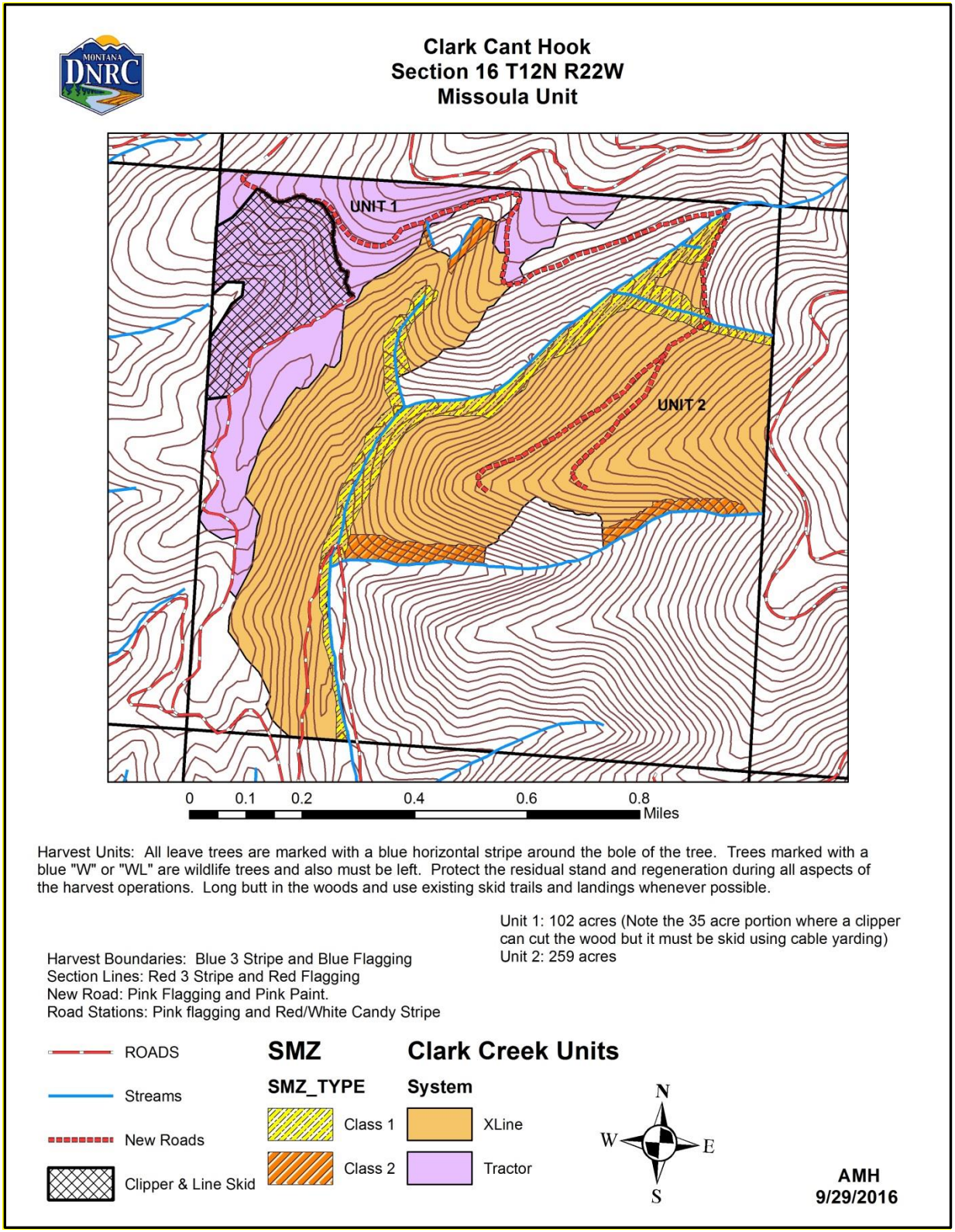
Name: Jonathan Hansen
Title: Missoula Unit Manager
Date: November 28, 2016
Signature: /s/ Jonathan Hansen

Attachment A - Maps

A-1: Clark Cant Hook Project Vicinity Map



A-2: Clark Cant Hook Project Map



Attachment B – Vegetation

Clark Cant Hook Timber Sale – Vegetation Analysis

Analysis Prepared By:
Name: Amy Helena-Forest Vegetation & Jeff Collins-Noxious Weeds
Title: Forest Management Supervisor, Missoula Unit, Montana DNRC & Hydrologist/Soil Scientist, Southwest Land Office, Montana DNRC

Introduction

The vegetation section describes present conditions and components of the forest as well as the anticipated effects of both the No-Action and the Action Alternatives.

Issues

- Timber harvesting and road building may introduce or spread noxious weeds in the project area.
- Forest management activities may adversely affect Old Growth.
- Root rot may continue to cause mortality in the overstory if no treatment takes place
- Shade tolerant species would continue to out-compete seral species, preventing stands from maintaining their historic cover type and species distribution.
- Stands are currently overstocked

Issues dismissed from further review

- *There is concern the proposed project could negatively impact populations of threatened, endangered, or sensitive plant species.*

This issue has been dismissed from further study because no rare plants have been identified within the project area through field surveys or a search of the Montana Natural Heritage Program. Therefore no direct, indirect, or cumulative impacts to rare plants would be expected under either alternative.

Regulatory Framework

The following plans, rules, and practices have guided this projects planning and/or would be implemented during project activities:

State Forest Land Management Plan
DNRC developed the SFLMP to "provide field personnel with consistent policy, direction, and guidance for the management of state forested lands" (DNRC 1996: Executive Summary). The SFLMP provides the philosophical basis, technical rationale, and direction for DNRC's forest management program. The SFLMP is

premised on the philosophy that the best way to produce long-term income for the trust beneficiaries is to manage intensively for healthy and biologically diverse forests. In the foreseeable future, timber management would continue to be the primary source of revenue and primary tool for achieving biodiversity objectives on DNRC forested state trust lands.

DNRC Forest Management Rules
DNRC Forest Management Rules (*ARM 36.11.401 through 456*) are the specific legal resource management standards and measures under which DNRC implements the SFLMP and subsequently its forest management program. The Forest Management Rules were adopted in March 2003 and provide the legal framework for DNRC project-level decisions and provide field personnel with consistent policy and direction for managing forested state trust lands. Project design considerations and mitigations developed for this project must comply with applicable Forest Management Rules.

Montana Best Management Practices (BMPs) for Forestry
Montana BMPs consist of forest stewardship practices that reduce forest management impacts to water quality and forest soils. The implementation of BMPs by DNRC is required under *ARM 36.11.422*. Key forestry BMP elements include: streamside management; road design and planning; timber harvesting and site preparation; stream crossing design and installation; winter logging; and hazardous substances storage, handling, and application.

Montana DNRC Forested Trust Lands Habitat Conservation Plan (HCP)
DNRC is managing the habitats of threatened and endangered species on this project by implementing the Montana DNRC Forested Trust Lands Habitat Conservation Plan (HCP) and the associated Incidental Take Permit that was issued by the United States Fish & Wildlife Service (USFWS) in February of 2012 under Section 10 of the Endangered Species Act. The HCP identifies specific conservation strategies for managing the habitats of grizzly bear, Canada lynx, and three fish species: bull trout, westslope cutthroat trout, and Columbia redband trout. This project complies with the HCP.

Analysis Areas

Direct and Secondary Effects Analysis Area
The proposed treatment areas-Approximately 361 acres

Cumulative Effects Analysis Area
The proposed project area-Section 16 T12N R22W-640 acres

Existing Conditions

Noxious Weeds
Currently noxious weeds are minimal in the project area and are mainly a combination of knapweed (Centaurea maculosa) and houndstongue (Cynoglossum officinale L). Knapweed was found along roadsides as well as in some forested portions of the project area. Spotty houndstongue infestations were found along roadsides, along the access haul routes, on adjacent lands and oddly within undisturbed forest sites, possibly transported by wildlife. Road use, timber harvest activities, animal vectors, and soil disturbance from fire are most likely the reasons for the existing rate of spread of noxious weeds and the potential future spread and introduction of noxious weeds. The prevailing winds from the west also carry windblown weed seed from lower valley locations where weeds are more prevalent. Moist sites with well-established surface vegetation provide

a competitive advantage over noxious weed establishment. Reseeding of some roadcuts followed by roadside, spot herbicide treatments and release of bio-control insects can be most effective in reducing the spread of noxious weeds. DNRC has not completed herbicide treatments along portions of the access roads. Weed management treatments on adjacent ownerships in the area varies from no-action to combinations of revegetation, herbicide treatments and bio-control measures.

Standard Vegetative Community

- **Stand History/Past Management**

This area falls within climatic section M333D, which was historically 98% forested. (Losensky, 1997). Climatic Section M333D includes the area between the Coeur D' Alene Mountains, Ninemile Divide and the state boundary from Missoula to Heron. The project area ranges in elevation from 4,200'-5,600'. In climatic section M333D midslopes were historically dominated by the larch-Douglas-fir type, with ponderosa pine mainly found on lower elevations. The age class in this section was slightly younger, and the percentage of old stands for all types is lower here than anywhere else in the state. This led Losensky to believe the fire year of 1889 or a more frequent occurrence of stand replacing fires in the area made an impact in shaping this type. (Losensky 1997)

During timber sale layout and field reconnaissance evidence of fire was observed throughout the project area. Large older ponderosa, larch and Douglas-fir contained fire scars. Several patches of "dog hair" Douglas-fir and larch have grown in areas where stand replacement fires occurred periodically over the past 100 years.

Past DNRC management activities include:

- Christmas tree removal projects that occurred form the 1940s-1960s.
- A Timber Sale 1958 (removed Douglas-fir and ponderosa)
- A Timber Sale in 1969 (removed Douglas-fir and ponderosa)
- A Timber Sale in 1987 (removed larch, Douglas-fir and ponderosa)

- **Current stand conditions**

The current stand condition in the project area is a result of past timber management and wildfire activity and/or suppression. Current cover types differ from the desired future condition (DFC). See table V-1 for current project area cover types as well as the DFC for the project area.

Table V-1 – Current and appropriate cover type for the Clark Cant Hook Project Area.

Cover Type	Current Acres	Current Percent of Project Area	Desired Future Condition (DFC)	
			Acres	Percent
Subalpine fir	0	0%	0	0%
Douglas-fir	0	0%	0	0%
Lodgepole pine	0	0%	0	0%
Mixed conifer	0	0%	0	0%
Ponderosa pine	460	72%	572	89%
Western larch/Douglas-fir	180	28%	68	11%

Cover Type	Current Acres	Current Percent of Project Area	Desired Future Condition (DFC)	
Western white pine	0	0%	0	0%
Non-stocked	0	0%	0	0%
Non-forest	0	0%	0	0%
Other (specify)	0	0%	0	0%
Total:	***640***	***100***	***640***	***100***

Species composition, size, density and age class in the project area vary by past disturbance and aspect.

Root rot is prevalent in Douglas-fir throughout the project area. Approximately 30% of Douglas-fir across all size classes are experiencing some level of root rot induced stress or mortality. Fading tops, mycelium on outside root collar, conks and standing dead trees and snags can be observed throughout the project area. In some isolated pockets trees infected with root rot are also being infested with Douglas-fir beetle (*Dendroctonus pseudotsugae*). These tend to be the larger diameter Douglas-fir.

Areas that were previously harvested using a selection harvest contain a two tier stand structure, with an overstory dominated by Ponderosa pine and Douglas-fir 16”-28” DBH on a variable. A majority of these overstory trees have high amounts of defect. Examples of defect include: fire scars, cat faces, forked tops, multiple tops crook, sweep and logging damage. The second tier is a mix of ponderosa pine and Douglas-fir advanced regeneration ranging in height from 2-20 feet tall and diameters range from 0”-5” DBH.

Areas that were not previously harvested vary by aspect as well as past fire disturbance.

- Northerly aspects contain a three tier stand structure. These stands appear to historically have had partial stand replacing fires. The overstory is populated by 16-30” DBH western larch, ponderosa pine and Douglas-fir. These trees vary in spacing from clumps of one or two existing 5 feet apart to a wider spacing of 30-60 feet apart. A percentage of species contain cat faces and fire scars, indicating fire historically burned in the area. The second tier is a mix of Douglas-fir and western larch 4”-8” DBH and heights ranging from 15-25 feet tall. Trees are approximately 4-6 feet apart (2,000+ stems per acre) and are stagnant, showing very little growth. This second tier exists in small clumps (less than an acre) scattered throughout the stand. There is little to no ground vegetation because sunlight rarely reaches the ground due to the thick canopy; however there is a thick litter layer comprised of needles, pine cones and other downed material (these clumps exhibit characteristics of areas that experienced stand replacing fires). In openings recently created by root rot regeneration 2’-10’ tall exist. Douglas-fir is the predominant species followed by ponderosa pine and an occasional group of western larch.

- All other aspects exhibit stand characteristics more consistent with dry slopes. Ponderosa pine dominate the overstory followed by Douglas-fir. Western larch, grand fir and cedar can be found in creek bottoms. Overstory diameters range from 12”-30+” dbh. In some areas these trees are spaced 20-40’ feet apart with ninebark or pine grass being the only other vegetation on site. In areas that experience less direct sunlight, Douglas-fir 4”-12” dbh exist in tight clumps (up to 2 acres), with scattered ponderosa pine 6”-30” dbh present. Regeneration is less

common on these slopes, generally only existing in openings created by root rot located in draws and near the creek bottom.

As mentioned, root rot is prevalent in Douglas-fir throughout the project area. Approximately 30% of Douglas-fir across all size classes are experiencing some level of root rot induced stress or mortality. Fading tops, mycelium on outside root collar, conks and standing dead trees and snags can be observed throughout the project area. In some isolated pockets trees infected with root rot are also being infested with Douglas-fir beetle (*Dendroctonus pseudotsugae*). These tend to be the larger diameter Douglas-fir.

Old Growth

Old Growth is identified and analyzed using criteria outlined in Green et al. Stand Level Inventories of the project area were queried to identify potential Old Growth and Old Growth stands. See table V-2 for current verified Old Growth within the project area.

Table V-2 –Old Growth in project area

Stand ID	SLI Old Growth Status	*Field Verified Old Growth Status	Old Growth Type	Acres of verified Old Growth
00009	**Old Growth**	**N/A**	**5**	**10.6**
TOTAL				**10.6 acres**

**The" field verified Old Growth status" column indicates Old Growth status following field verification in which all the stands listed in the table were sampled.*

Environmental Effects

No Action Alternative: Direct, Secondary and Cumulative Effects

Under the No Action Alternative, natural processes would continue to have a direct influence on forest conditions. Root rot would continue to cause mortality in Douglas-fir across all size classes Douglas-fir would continue to out compete species historically present across all age classes, further removing the stands from the desired future condition.

With no action, noxious weeds will continue to spread along roads and may increase on the drier site habitats. Limited weed control efforts on access roads across multiple ownerships in the area increases the potential for windblown seed. DNRC would continue to treat selected sites on DNRC roads based on priorities and funding availability, but the levels of weed control treatments would be lower than with the action alternative. If new weed invader species are found they would have highest priority for management. On state land parcels the grazing licensees would be required to continue weed control efforts consistent with their use.

Cumulative effects of noxious weeds within the project areas are moderate. Weeds have spread across ownerships over time from wind, fire, traffic, forest management, wildlife and grazing animals. As tree density and ground cover vegetation increase over time, weeds are reduced through vegetative competition.

Action Alternative: Direct, Secondary, and Cumulative Effects

Noxious Weeds

Direct, Secondary & Cumulative Effects

Implementation of the action alternative would involve ground-disturbing activities that have the potential to introduce or spread noxious weeds in susceptible habitat types. An Integrated Weed Management (IWM) approach would be considered for treatment of existing and prevention of potential noxious weeds. For this proposed project: prevention, revegetation of new roads and weed control measures on existing roads were considered the most effective weed management treatments. Summary Table W-1 displays the potential impacts of noxious weeds.

Prevention measures would require cleaning off-road equipment. Roadsides would be sprayed prior to operations and weed control and revegetation would slow noxious weed spread and reduce weed density and occurrence compared to no-action. There would be a similar or potential slight increase in weed infestation within harvest units due to soil disturbance and reduction of tree canopy. The silvicultural prescriptions were designed to control disturbance while achieving the scarification goals needed for sustained forest growth. The predominant cable harvest would result in low disturbance. Noxious weed control efforts would promote rapid revegetation and emphasize treatment of any new noxious weeds found.

Herbicide application would be completed on segments of DNRC roads along the haul route to reduce weed spread along roads, promote desired vegetation for weed competition and to reduce sedimentation. Herbicide would be applied according to labeled directions as well as all applicable rules and regulations, and would be applied with adequate buffers to prevent herbicide runoff to surface water resources. Implementation of IWM measures listed in the mitigations are expected to reduce existing weeds, limit the possible spread of weeds, improve current conditions, and promote existing native vegetation. More weed control would occur compared to the no-action alternative and grass and competitive vegetation would increase along roads.

Overall cumulative effects of increased noxious weeds within the project area would be moderate based on herbicide treatments of existing weeds along roads and implementing prevention measures to reduce new weeds, by cleaning equipment and planting grass on roads to compete against weeds. The combined efforts of weed control across ownerships continues to improve through cooperative efforts with the Missoula County Weed District and local weed control interest groups.

Table W-1 Summary of Noxious Weed Impacts by Alternative

Vegetation	Impact								Can Impact Be Mitigated ?	Comment Number
	Direct & Secondary				Cumulative					
	No	Low	Mod	High	No	Low	Mod	High		
No-Action										
Noxious Weeds			**X**				**X**			
Rare Plants	**X**				**X**					
Vegetative community	**X**				**X**					
Old Growth	**X**				**X**					
Action										
Noxious Weeds			**X**				**X**		**Y**	
Rare Plants	**X**				**X**					
Vegetative community										
Old Growth										

Standard Vegetative Community

Direct, Secondary & Cumulative Effects

The proposed action alternative would treat approximately 361 acres out of the 640 acre project area. Treatment type and size would vary based on stand conditions. The proposed treatment types would include:

- Tree planting could occur on approximately ~100 acres if natural regeneration does not occur. Areas currently experiencing high amounts of root rot, and subsequent mortality in the Douglas-fir, would be planted with ponderosa pine or western larch.

- The Clark Cant Hook Timber Sale would promote future desired conditions and emulate natural disturbances based on fire regimes historically present in the project area. This harvest would utilize ground based and cable yarding (excaline) systems to harvest 361 acres in the 640 acre project area. The sanitation/salvage prescription would remove dead and dying trees impacted by insects and disease such as Douglas-fir beetle and root rot. In addition trees with poor form and growth (forked tops, crook, sweep, flat tops and showing signs of little to no growth) would also be removed. Advanced regeneration would be protected during operations. Post harvest stands would appear more open and park like. Large ponderosa and western larch would be present across the landscape at a stand density of 20-60 trees/acre. Young, vigorous ponderosa, Douglas-fir and larch would remain present in clumps, however within the clump trees would be spaced variably at 16-25 foot, to allow for increased nutrient and water retention. At least two snag and snag recruits per acre would exist scattered among the overstory component.

- Harvest would occur in Streamside Management Zones (SMZ). Depending on slope, these areas vary from 50 feet -100 feet from the stream. Trees marked to cut were concentrated to the outer edge of the SMZ to ensure protection along stream banks. No harvest would occur within 50 feet of a class one stream.

Fuel loading concerns would vary according to the pre-harvest stand. In accordance with ARM 36.11.410 and ARM 36.11.414 the majority of fine slash foliage and approximately 5 to 15 tons of coarse woody debris would be left scatted on the forest floor in all harvest units. This would increase the intensity and reduce the ability to control ground fires in all harvest units for approximately three years. In stands that have numerous leave trees following harvest this could result in ground fires killing trees and an increased risk of crown fires. In areas with few leave trees the risk of a catastrophic crown fires would decrease.

Given the following factors:

- Douglas-fir across all size classes are currently succumbing to root rot.

- Post harvest the overall stand health and vigor would be improved in the residual overstory.

- Shade tolerant species would be removed, favoring seral species.

- Trees resistant to root rot would be planted if natural regeneration does not occur.

The proposed action would be expected to result in low to moderate direct, indirect, and cumulative impacts on forest vegetation beyond those projected for the no action alternative.

Old Growth

Direct, Secondary & Cumulative Effects

10.6 acres of Old Growth exist within the treatment area (as defined by Green et. al. The following table illustrates Old Growth acres pre and post harvest for the treatment area (direct and secondary effects analysis area) and the project area (Cumulative effects analysis area).

Table V-3 –Old Growth acres pre and post harvest for treatment and project areas.

Stand ID	Project area current Old Growth acres	Post harvest project area Old Growth acres	Treatment Area current Old Growth Acres	Post harvest treatment area Old Growth acres
00009	**10.6**	**10.6**	**10.6**	**10.6**
TOTAL	**10.6 acres**	**10.6 acres**	**10.6 acres**	**10.6 acres**

Within the treatment area the stand containing Old Growth would receive an Old Growth Maintenance treatment. This treatment would be designed to retain Old Growth attributes, including large live trees and snags. Shade tolerant species are targeted for removal. This prescription is consistent with the sanitation/salvage treatment mentioned earlier in the standard vegetative community effects analysis. Post harvest stands would retain Old Growth classification.

Given the following factors:

- post treatment all stands would retain Old Growth classification
- shade tolerant species would be removed, favoring seral species historically present on the site

The proposed action would be expected to result in low to moderate direct, indirect, and cumulative impacts on Old Growth beyond those projected for the no action alternative.

Vegetation Mitigations

- Favor western larch and ponderosa pine to limit effects of root rot in the project area.
- If natural regeneration does not occur, plant western larch or ponderosa pine in root rot infected areas to convert stands to a resistant species.
- Conduct Old Growth maintenance treatments to maintain Old Growth on the landscape.
- Wash equipment prior to harvest to limit weed seed dispersal.
- Spray weeds along roadsides to limit spread of existing weeds.
- Plant grass on newly disturbed road surfaces to limit the resources available for weeds to become established.

Recommended Mitigations and Adjustments of Treatments for the Benefit of Other Resources

- Snags, snag recruits, and coarse woody debris would be managed according to *ARM 36.11.411* through *36.11.414*, particularly favoring western larch. Clumps of existing snags would be maintained

where they exist to offset areas without sufficient snags. Coarse woody debris retention would emphasize retention of downed logs of 15-inch diameter or larger.

VEGETATION REFERENCES

Green, P., J. Joy, D. Sirucek, W. Hann, A. Zack, and B. Naumann. 1992. Old-growth forest types of the Northern Region. R-1 SES. Unpublished report on file at US Forest Service, Northern Region, Missoula, MT.

Hayes, S., T. Morgan. 2016. Montana's Forest Products Industry and Timber Harvest 2014. Bureau of Business and Economic Research Report, Missoula, MT.

Montana Natural Heritage Program (MTNHP). 2013. Plant species of concern report. Available online at: http://mtnhp.org/SpeciesOfConcern/?AorP=p. Last accessed November, 5, 2014.

Attachment C –Wildlife

Clark Cant Hook – Wildlife Analysis

Analysis Prepared By:

Name: Garrett Schairer

Title: Wildlife Biologist, Montana DNRC

Introduction

The following sections disclose the anticipated direct, indirect, and cumulative effects to wildlife resources from the proposed action in the project area and cumulative-effects analysis areas described for each resource category. Past and ongoing activities on all ownerships, as well as planned future agency actions, have been taken into account in each cumulative-effects analysis for each resource topic.

Issues

- Proposed activities could alter mature forested habitats and/or landscape connectivity, which could affect species that rely on these mature forested habitats, and/or alter connectivity and the ability of wildlife requiring corridors to move through the landscape.
- Proposed activities could negatively affect Canada lynx by altering lynx winter foraging habitat, summer foraging habitat, and other suitable habitat, rendering these habitats unsuitable for supporting lynx.
- Proposed activities could reduce the amount and/or quality of fisher habitats, which could alter fisher use of the area.
- Proposed activities may alter flammulated owl habitat by reducing canopy closure and increasing tree spacing, and could remove snags needed by flammulated owls for nesting.
- Proposed activities could displace gray wolves from important habitats, particularly denning and rendezvous sites, and/or alter prey availability.
- Proposed activities could reduce suitable nesting and foraging habitat for pileated woodpeckers, which could alter pileated woodpecker use of the area.
- Proposed activities could disturb nesting red-tailed hawks and/or modify nesting habitats for red-tailed hawks.
- Proposed activities could remove forest cover on big game winter range, which could reduce the carrying capacity of the winter range.
- Proposed activities could remove big game security cover, which could affect hunter opportunity and local quality of recreational hunting.

Regulatory Framework

Various legal documents dictate or recommend management direction for terrestrial wildlife species and their habitats on state trust lands. The documents most pertinent to this project include but are not limited to: DNRC Forest Management Rules, MT DNRC Forested State Trust Lands Habitat Conservation Plan, the Endangered Species Act, the Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act.

Analysis Areas

The discussions of existing conditions and environmental effects within each subsection pertain to land areas of 2 different scales. The first scale of analysis is the Project Area (640 acres), which includes the DNRC-managed lands in section 16 in T12N, R22W where activities are being proposed. The second scale is the cumulative-effects analysis area, which refers to a broader surrounding landscape useful for assessing cumulative effects to wildlife and habitat. For this proposed project, two distinct cumulative-effects analysis areas were identified. The first cumulative effects analysis area includes the project area and those lands within 1 mile of the project area (5,791 acres). This area includes 640 acres (11%) that are managed by DNRC, 1,468 acres (25%) managed by US Forest Service, and 3,652 acres (63%) that are privately owned. The second cumulative effects analysis area is approximately 29,124 acres and includes the portion of the Graves Creek mountain range north of Lolo Creek between Graves Creek, Telephone Butte, Woodman Saddle, and Anderson Gulch. This cumulative effects analysis area contains sizeable areas managed by US Forest Service (16,178 acres, 56%) as well as a large component of privately-owned (12,306 acres, 42%) lands. The project area is the only DNRC-managed parcel in this cumulative effects analysis area.

Analysis Methods

Analysis methods are based on DNRC State Forest Land Management Rules, which are designed to promote biodiversity. The primary basis for this analysis includes information obtained by: field visits, review of scientific literature, Montana Natural Heritage Program (MNHP) data queries, DNRC Stand Level Inventory (SLI) data analysis, aerial photograph analysis, and consultation with other professionals.

In the fine-filter analysis, individual species of concern are evaluated. These species include wildlife species federally listed under the Endangered Species Act, species listed as sensitive by DNRC, and species managed as big game by the Montana Dept. of Fish Wildlife and Parks (DFWP).

Coarse Filter Wildlife Analysis

Issue

Proposed activities could alter mature forested habitats and/or landscape connectivity, which could affect species that rely on these mature forested habitats, and/or alter connectivity and the ability of wildlife requiring corridors to move through the landscape.

Introduction

A variety of wildlife species rely on mature to old stands for some or all life requirements. Mature forests, generally characterized by abundant large diameter trees and dense canopy cover, play an important role in providing food, shelter, breeding sites, resting areas, and/or travel corridors for certain animals. Wildlife use of older, mature forests is species-specific; some species use this habitat exclusively, other species only

temporarily or seasonally, and some species avoid mature forests altogether. Several species known to be strongly associated with mature and old forests include American marten (*Martes americana*), northern goshawk (*Accipter gentilis*), and winter wrens (*Troglodytes troglodytes*).

Forested landscapes in the western United States were historically shaped by natural disturbance events; primarily wildfire, blowdown, and pest outbreaks. Resulting broad landscape patterns were a mosaic of forest patches varying in age, composition and development. Timber harvest, like stand-replacement fire and blowdown, is a disturbance event that can create open, non-forested patches that over time develop into young, conifer forests. Patch size, age, shape, abundance, and distance to similar patches (connectivity) can be factors influencing wildlife use. The way through which patch characteristics influence wildlife use and distribution are dependent upon the particular species and its habitat requirements. Temporary non-forested openings, patches, and forest edges created by timber harvest and associated roads may be avoided by certain wildlife species adapted to mature, well-stocked forest. In contrast, other wildlife species flourish in early seral habitats created by disturbance. Connectivity under historical fire regimes within forest types found in the vicinity of the project area was likely relatively high as fire differentially burned various habitats across the landscape (Fischer and Bradley 1987).

Analysis Area
Direct and indirect effects were analyzed for activities conducted in the 640-acre project area. Cumulative effects were analyzed on a 29,124-acre area described above in the Analysis Areas portion of this analysis. This scale of analysis would be large enough to support a diversity of species that use mature forested habitats and/or require connected forested habitats.

Affected Environment
The project area currently contains approximately 587 acres (92% of project area) of mature stands (100-plus years in age) of Douglas-fir, western larch, and ponderosa pine stands that have a reasonably closed canopy. One 10-acre stand in the project area looks to meet the definition of Old Growth (Green et al. 1992; see Vegetation section for additional details). Currently, forested areas cover most of the project area, facilitating some use by those species requiring connected-forested conditions and/or forested-interior habitats.

A portion of the 10,855 acres (38% of cumulative effects analysis area) of forested habitats and some of the 5,361 acres of moderately stocked forested stands (19% of cumulative effects analysis area) on other ownerships in the cumulative effects analysis area are likely also providing habitat for those species requiring mature, forested habitats and/or forested connectivity. Conversely, much of the 12,299 acres (43% of cumulative effects analysis area) of shrubs, herbaceous areas, poorly stocked forested stands, and recently harvested stands on other ownerships in the cumulative effects analysis area is likely to open to be useful for these species requiring forested habitats. Past timber management, recent wildfires, human developments, roads, and the natural openness of certain habitats in the cumulative effects analysis area has influenced landscape-level connectivity in the cumulative effects analysis area.

Environmental Effects- Mature Forested Habitats and Landscape Connectivity

No Action Alternative: Direct and Indirect Effects
No appreciable changes to existing stands would be anticipated. Stands providing forested cover that may be functioning as corridors, including riparian areas, saddles, and ridgelines, would not be altered. No changes to the stand meeting the old stand definition would occur. No changes in human developments, motorized access, or visual screening would occur. No changes in wildlife use would be expected. Thus, no direct or indirect effects to mature forested habitats and landscape connectivity would be expected since: 1) no changes to existing stands would occur; 2) no changes to human developments, motorized access, or visual screening would occur, and 3) no alterations to existing corridors would be anticipated.

No Action Alternative: Cumulative Effects
No appreciable changes to existing stands would be anticipated. Stands providing forested cover that may be functioning as corridors, including riparian areas, saddles, and ridgelines, would not be altered. Past harvesting and recent wildfires have reduced the amount of mature, forested habitats in a sizeable portion of the cumulative effects analysis area; however, continued successional advances across the cumulative effects analysis area are moving stands toward mature forests. This alternative would continue to contribute to the amount of mature forested stands in the cumulative-effects analysis area. No changes in human developments, motorized access, or visual screening would occur. No changes in wildlife use would be expected. Thus, no cumulative effects to mature forested habitats and landscape connectivity would be expected since: 1) no changes to existing stands would occur; 2) no changes to human developments, motorized access, or visual screening would occur; and 3) no alterations to existing corridors would be anticipated.

Action Alternative: Direct and Indirect Effects
Approximately 356 acres (61%) of existing mature Douglas-fir, western larch, and ponderosa pine stands with a closed canopy would be harvested. The majority of these stands would receive a treatment that would reduce habitat for those species relying on mature, closed-canopied forested habitats. In general, habitats for those species adapted to more-open forest conditions would increase in the project area, meanwhile habitats for wildlife species that prefer dense, mature forest conditions would be reduced in the project area. Although proposed treatments on 361 acres (56% of the project area) would create more open stands that may not be used by wildlife species that use mature stands to move through the landscape, corridors, particularly along draws, ridges, and other topographic features, would be retained. Roughly 8 acres that meet the old stand definition would be harvested with an old-growth maintenance treatment, thus no changes to the amount of old stands in the cumulative effects analysis area. Proposed planting would improve the development of future mature forested stands in those areas treated. No changes in legal motorized public access would occur in the project area. Additionally, the only permanent human development constructed would be roughly 2.1 miles of new restricted roads; however, this could increase non-motorized human activity in the project area beyond the proposed timber management activities. Contract stipulations would minimize the presence of human-related attractants for the duration of the proposed activities. Some changes in visual screening would occur within individual units, but the combination of irregular-shaped units, topography, un-harvested patches throughout the project area, and distance from open roads would minimize the effects of the reductions in visual screening. Thus, a moderate risk of adverse direct and indirect effects to mature forested habitats and landscape connectivity would be expected since: 1) proposed activities could reduce forested cover in a sizeable portion of the project area (56%), but corridors would be retained; 2) increased human developments in the form of restricted roads, could concentrate human activity, but no changes in human-related attractants would occur; 3) no changes to legal motorized public access would occur, but increases in non-motorized access could facilitate increased human use of the project area; and 4) visual screening in portions of the project area would be reduced, but some visual screening would be retained across the project area.

Action Alternative: Cumulative Effects
Modifications to mature, forested habitats associated with this alternative would be additive to losses associated with past harvesting activities and recent wildfires in the cumulative effects analysis area. Across the cumulative effects analysis area a variety of stands are providing for wildlife movements. Minor increases in human developments would occur with the proposed construction of roughly 2.1 miles of restricted roads. No changes in the presence of human-related attractants would occur. No changes to legal motorized public access to the cumulative effects analysis area would occur. Minor reductions in visual screening in a small portion of the cumulative effects analysis area would be anticipated. Thus, a minor risk of adverse cumulative effects to mature forested habitats and landscape connectivity would be expected since: 1) proposed activities could reduce forested cover in a small portion of the cumulative effects analysis area, but corridors would exist; 2) minor increases in human developments that could concentrate human activities would occur, but no changes in human-related attractants would occur; 3) no changes to motorized public access would occur; and

4) visual screening in a small portion of the cumulative effects analysis area would be reduced, but considerable visual screening would persist across the cumulative effects analysis area.

Fine Filter Wildlife Analysis

In the fine-filter analysis, individual species of concern are evaluated. These species include those listed as threatened or endangered under the Endangered Species Act of 1973, species listed as sensitive by DNRC, and animals managed as big game by Montana DFWP. Table WI-1 – Fine Filter provides an analysis of the anticipated effects for each species.

Table WI-1 –Anticipated Effects of the Belmont Project on wildlife species

Species/Habitat	Potential for Impacts and Rationale [Y/N] Potential Impacts and Mitigation Measures N = Not Present or No Impact is Likely to Occur Y = Impacts May Occur (Explain Below) L = Low Potential for Effects
Threatened and Endangered Species	
Grizzly bear *(Ursus arctos)* Habitat: Recovery areas, security from human activity	[N] The project area is 25 miles south of the Northern Continental Divide Ecosystem grizzly bear recovery area and is also 25 miles south of `occupied' grizzly bear habitat as mapped by grizzly bear researchers and managers to address increased sightings and encounters of grizzly bears in habitats outside of recovery zones (Wittinger et al. 2002). Several years ago an individual grizzly bear was documented passing through the vicinity of Lolo, MT. Individual animals could occasionally use the project area while dispersing or possibly foraging, and they could be displaced by project-related disturbance if they are in the area during proposed activities. However, given their large home range sizes, and manner in which they use a broad range of forested and non-forested habitats, the proposed activities and alterations of forest vegetation on the project area would have negligible influence on grizzly bears.
Canada lynx (*Felix lynx)* Habitat: Subalpine fir habitat types, dense sapling, old forest, deep snow zone	[Y] Detailed analysis provided below.
Sensitive Species	
Bald eagle *(Haliaeetus leucocephalus)* Habitat: Late-successional forest more than 1 mile from open water	[N] The proposed project area is outside of any home range associated with bald eagle territories in the vicinity. Thus, no direct, indirect, or cumulative effects to bald eagles would be anticipated.
Black-backed woodpecker	[N] No preferred, recently (less than 5 years) burned areas are in the project area. Thus, no direct, indirect, or cumulative effects to black-backed woodpeckers would be expected to occur as a result

(Picoides arcticus) Habitat: Mature to old burned or beetle-infested forest	of either alternative.
Coeur d'Alene salamander *(Plethodon idahoensis)* Habitat: Waterfall spray zones, talus near cascading streams	[N] No moist talus or streamside talus habitat occurs in the project area. Thus, no direct, indirect, or cumulative effects to Coeur d'Alene salamanders would be expected to occur as a result of either alternative.
Columbian sharp-tailed grouse *(Tympanuchus Phasianellus columbianus)* Habitat: Grassland, shrubland, riparian, agriculture	[N] No suitable grassland communities occur in the project area. Thus, no direct, indirect, or cumulative effects to Columbian sharp-tailed grouse would be expected to occur as a result of either alternative.
Common loon *(Gavia immer)* Habitat: Cold mountain lakes, nest in emergent vegetation	[N] No suitable lakes occur in the project area. Thus no direct, indirect, or cumulative effects to common loons would be expected under either alternative.
Fisher *(Pekania pennanti)* Habitat: Dense mature to old forest less than 6,000 feet in elevation and riparian	[Y] Detailed analysis provided below.
Flammulated owl *(Otus flammeolus)* Habitat: Late-successional ponderosa pine and Douglas-fir forest	[Y] Detailed analysis provided below.
Gray Wolf *(Canis lupus)* Habitat: Ample big game populations, security from human activities	[Y] Detailed analysis provided below.
Harlequin duck *(Histrionicus histrionicus)* Habitat: White-water streams, boulder and cobble substrates	[N] No suitable high-gradient stream or river habitats occur in the project area. No direct, indirect or cumulative effects to harlequin ducks would be expected to occur as a result of either alternative.
Mountain plover (*Charadrius montanus*) Habitat: short-grass prairie,	[N] No prairie dog colonies or other shortgrass prairie habitats occur in the project area. Thus, no direct, indirect, or cumulative effects to mountain plovers would be anticipated to occur as a result of either alternative.

alkaline flats, prairie dog towns	
Northern bog lemming *(Synaptomys borealis)* Habitat: Sphagnum meadows, bogs, fens with thick moss mats	[N] No suitable sphagnum bogs or fens occur in the project area. Thus, no direct, indirect, or cumulative effects to northern bog lemmings would be expected to occur as a result of either alternative.
Peregrine falcon *(Falco peregrinus)* Habitat: Cliff features near open foraging areas and/or wetlands	[N] No preferred cliffs or suitable rock outcrops suitable for use by peregrine falcons occur on, or within 1 mile of the proposed project area. Thus, no direct, indirect, or cumulative effects to peregrine falcons would be anticipated as a result of either alternative.
Pileated woodpecker *(Dryocopus pileatus)* Habitat: Late-successional ponderosa pine and larch-fir forest	[Y] Detailed analysis provided below.
Townsend's big-eared bat *(Plecotus townsendii)* Habitat: Caves, caverns, old mines	[N] No suitable caves or mine tunnels are known to occur in the project area or vicinity. Thus, no direct, indirect or cumulative effects to Townsend's big-eared bats would be anticipated as a result of either alternative.
Wolverine *(Gulo gulo)* Habitat: Alpine tundra and high-elevation boreal and coniferous forests that maintain deep persistent snow into late spring	[N] Generally wolverines are found in sparsely inhabited remote areas near treeline characterized by cool to cold temperatures year round and rather deep and persistent snow well into the spring (Copeland et al. 2010). The availability and distribution of food is likely the primary factor in the large home range sizes of wolverines (Banci 1994). The project area is generally below the elevations where wolverines tend to be located. No areas of deep persistent spring snow occur in the project area. Individual animals could occasionally use lands in the project area while dispersing or possibly foraging, and they could be displaced by project-related disturbance if they are in the area during proposed activities. However, given their large home range sizes (~150 sq. mi. -- Hornocker and Hash 1981), and manner in which they use a broad range of forested and non-forested habitats, the proposed activities and alterations of forest vegetation on the project area would have negligible influence on wolverines. Thus, minimal direct, indirect or cumulative effects to wolverines would be anticipated.
Other Species to Consider	
Red-tailed hawk *(Buteo jamaicensis)* Habitat: Open habitats, including agricultural, grasslands, woodlands, and meadows	[Y] Detailed analysis provided below.

Big Game Species	
Elk	[Y] Big game winter range exists in the project area. Potential big game security habitat exists in the project area - Detailed analyses provided below.
Moose	
Mule Deer	
White-tailed Deer	

Threatened and Endangered Species

CANADA LYNX

Issue
Proposed activities could negatively affect Canada lynx by altering lynx winter foraging habitat, summer foraging habitat, and other suitable habitat, rendering these habitats unsuitable for supporting lynx.

Introduction
Canada lynx are associated with subalpine fir forests, generally between 4,000 to 7,000 feet in elevation in western Montana (Ruediger et al. 2000). Lynx in western Montana preferred mature, multi-storied stands with dense horizontal cover year-round; during the summer lynx also selected earlier successional stands with a high horizontal cover (Squires et al. 2010). For denning sites, the primary component appears to be abundant large woody debris, particularly in the form of downed logs, root wads, slash piles, and live trees (Squires et al. 2008). These conditions are found in a variety of climax vegetation habitat types, particularly within the subalpine fir series (Pfister et al. 1977). Historically, high intensity, stand-replacing fires of long fire intervals (150 to 300 years) occurred in continuous dense forests of lodgepole pine, subalpine fir, and Engelmann spruce. These fires created extensive even-aged patches of regenerating forest intermixed with old stands that maintained a mosaic of snowshoe hare and lynx habitat.

Analysis Area
Direct and indirect effects were analyzed for activities conducted in the 640-acre project area. Cumulative effects were analyzed on a 29,124-acre area described above in the Analysis Areas portion of this analysis. The scale of this analysis area approximates the home range size of an individual lynx (Ruediger et al. 2000).

Existing Environment
The proposed project area ranges from approximately 4,200 to 5,640 feet in elevation and is dominated by Douglas-fir, Douglas-fir/western larch, and ponderosa pine. Approximately 114 acres of lynx habitat occur in the project area (Table WI-2 – Canada lynx habitats and anticipated changes to existing lynx habitats under both alternatives of the Clark Cant Hook Project). The potential habitats in the project area are fairly evenly split between winter/mature foraging habitat and other suitable habitats (largely forested lands that provide cover to facilitate movement); considerable non-lynx habitats are present in the project area. Connectivity of forested habitats in the project area is relatively good, but has been altered by past timber management. Extensive use of the project area by lynx is unlikely given the limited habitats present and the extent of unsuitable habitats in the project area.

The cumulative effects analysis area varies in elevation and stand types with lower elevations dominated by ponderosa pine and Douglas-fir to higher elevations dominated by lodgepole pine, subalpine fir, western larch, and mixed conifers. Similarly, potential Canada lynx habitats range from generally unsuitable in the drier and warmer areas to potentially suitable in the higher, cooler, and moister areas in the cumulative effects analysis

area. On other ownerships in the cumulative effects analysis area, there are roughly 10,855 acres (38% of non-DNRC lands) of forested stands with a reasonably closed canopy; a portion of those stands would likely be suitable lynx habitats and probably include some winter/mature foraging habitats and other suitable habitats. Additionally, summer/young foraging habitats likely exists on a portion of the 12,299 acres (43% of non-DNRC lands) of sparsely stocked and young forest on other ownerships; no lynx habitats likely exist on the 4,439 acres (16% of non-DNRC lands) of shrubs, herbaceous, and non-forested types on other ownerships in the cumulative effects analysis area. Connectivity of lynx habitats within the cumulative effects analysis area is rather limited due to ownership, past timber management, interspersion of suitable and unsuitable types, and recent wildfires. Roughly 77.4% of habitats on DNRC-managed lands administered by the Southwestern Land Office under the HCP and outside of the Lynx Management Areas, which includes the project area, are in suitable lynx habitat categories.

Environmental Effects- Canada Lynx

No Action Alternative: Direct and Indirect Effects
In the short-term, no changes in lynx habitat elements would be expected in the project area. Landscape connectivity would not be altered. Thus, a negligible risk of adverse direct and indirect effects to Canada lynx would be expected since: 1) existing winter/mature foraging habitats would persist; 2) summer/young foraging habitats would continue to be a relatively minor component in the project area; 3) the amount of temporary non-suitable habitats would not change; and 4) landscape connectivity would not be altered.

No Action Alternative: Cumulative Effects
No appreciable change in lynx habitats in the cumulative effects analysis area would occur. No appreciable changes to landscape connectivity would be anticipated. Roughly 77.4% of habitats on DNRC-managed lands administered by the Southwestern Land Office under the HCP and outside of the Lynx Management Areas would be in suitable lynx habitat categories with this alternative. Thus, a negligible risk of adverse cumulative effects to lynx would be expected since: 1) some winter foraging habitats would persist in the cumulative effects analysis area; 2) summer foraging habitats would persist in the near-term across the cumulative-effects analysis area, but longer-term availability of summer foraging habitats would likely decline without disturbance; 3) no changes in the amount of the cumulative-effects analysis area that is in the temporary non-suitable habitat class would occur; and 4) landscape connectivity would not be altered.

Action Alternative: Direct and Indirect Effects
Approximately 83 acres of lynx habitats (73% of lynx habitats in the project area) would be altered with this alternative (Table WI-2 – Canada lynx habitats and anticipated changes to existing lynx habitats under both alternatives of the Clark Cant Hook Project). The proposed treatments in lynx habitats would be a combination of sanitation and salvage which would transition these habitats to temporary non-suitable habitats. A portion of these habitats could maintain sufficient cover to continue functioning as other suitable lynx habitats following proposed activities, but the majority would likely drop below the 40% canopy closure threshold that differentiates between suitable and temporary non-suitable habitats due to anticipated retention levels, harvesting corridors, skid trails, damage to sub-merchantable trees, landings, and low original stand density. Thus roughly 73% of the lynx habitats in the project area would be temporarily unsuitable for lynx following proposed treatments. Roughly 4% of the project area would be in foraging habitats and 24% would be in Other Suitable habitats following proposed treatments. The retention of patches of advanced regeneration of shade-tolerant trees, such as sub-alpine fir and Engelmann spruce in foraging habitats, would break-up sight distances, provide horizontal cover, and provide forest structural attributes preferred by snowshoe hares and lynx. Coarse woody debris would be retained (emphasizing retention of some logs 15 inches dbh and larger) to provide some horizontal cover and security structure for lynx. No appreciable changes in lynx use of the project area would be anticipated given the limited habitats present in the project area and the mosaic of unsuitable habitats intermixed with those habitats. Proposed activities would reduce forested connectivity in the project area; some connectivity would be retained along riparian areas and through unharvested patches between

harvested units. Proposed planting could facilitate a faster return to summer foraging and/or other suitable habitats than if left to natural regeneration. Collectively, a minor risk of adverse direct and indirect effects to Canada lynx would be expected since: 1) the majority of winter/mature foraging habitats (93%) would be removed and largely transitioned into temporary non-lynx habitats; 2) summer habitat would continue to be absent in the near term, but some could develop in the future as stands regenerate; 3) the amount of the project area in the temporary non-suitable lynx habitat category would increase to 73%; and 4) connectivity could be altered, but some connectivity would be maintained along riparian areas and through unharvested patches between units.

Table WI-2 –Acres of Canada lynx habitats and anticipated changes to existing lynx habitats under both alternatives of the Clark Cant Hook Project

Lynx Habitat Element	Existing Condition and No-Action Alternative	Proposed Changes Under Action Alternative	Action Alternative
Winter/Mature Foraging	54 (47%)	-50	4 (4%)
Summer/Young Foraging	0 (0%)	0	0 (0%)
Other Suitable	60 (53%)	-33	27 (24%)
Temporary Non-Suitable	0 (0%)	+83	83 (73%)
Total	114		114
Non-Lynx Habitats	527		527

Action Alternative: Cumulative Effects

Within the cumulative-effects analysis area, a sizable portion of the existing lynx habitats on DNRC-managed lands would be modified, and up to 83 acres (73%) would be in the temporary non-suitable habitat category following proposed treatments. The reductions in winter/mature foraging (50 acres) and other suitable lynx habitats (33 acres) coupled with an increase in temporary non-suitable habitats (83 acres) on a small portion of the cumulative effects analysis area could slightly decrease the quality of the lynx habitats in the larger cumulative effects analysis area. Near-term increases in summer/young foraging habitats could occur with the proposed harvesting within a portion of the cumulative effects analysis area. Anticipated reductions in lynx habitats would be additive to past losses from timber harvesting, recent wildfires, and any ongoing modifications in the cumulative-effects analysis area; likewise, increases in temporary non-suitable lynx habitats would be additive to habitats that have been recently converted due to timber harvesting and recent wildfires. No appreciable changes to the suitable lynx habitats on other ownerships would be anticipated. The existing mixture of suitable and unsuitable habitats in the vicinity of the project area caused by varying ownerships, past timber management, and wildfires has limited connectivity of upland forested habitats in the vicinity; proposed harvesting activities, would further affect connectivity away from riparian areas, but overall negligible changes to connectivity across the cumulative effects analysis area would be anticipated. Roughly 77.1% of habitats on DNRC-managed lands administered by the Southwestern Land Office under the HCP and outside of the Lynx Management Areas would be in suitable lynx habitat categories following proposed treatments. Thus, a minor risk of adverse cumulative effects to Canada lynx would be expected since: 1) some winter foraging habitats would persist; 2) summer foraging habitats would continue developing for the next 10 to 30 years across the cumulative effects analysis area; 3) a relatively small percentage of lynx habitats would be in the temporary non-suitable habitat category; and 4) negligible alterations in landscape connectivity would not prevent lynx movements.

Sensitive Species

FISHER

Issue
Proposed activities could reduce the amount and/or quality of fisher habitats, which could alter fisher use of the area.

Introduction
Fishers are a mid-sized forest carnivore whose prey includes small mammals such as voles, squirrels, snowshoe hares, and porcupines, as well as birds (Powell and Zielinski 1994). They also take advantage of carrion and seasonally available fruits and berries (Foresman 2012). Fishers use a variety of successional stages, but are disproportionately found in stands with dense canopies (Powell 1982, Johnson 1984, Jones 1991, Heinemeyer and Jones 1994) and avoid openings or young forested stands (Buskirk and Powell 1994, Weir and Corbould 2010). However, some use of openings may occur for short hunting forays or if sufficient overhead cover (shrubs or saplings) is present. Fishers appear to be highly selective of stands that contain resting and denning sites and tend to use areas within 150 feet of water (Jones 1991). Resting and denning sites are found in cavities of live trees and snags, downed logs, brush piles, mistletoe brooms, squirrel and raptor nests, and holes in the ground. Forest-management considerations for fisher involve providing for resting and denning habitats near riparian areas while maintaining travel corridors.

Analysis Area
Direct and indirect effects were analyzed for activities conducted in the 640-acre project area. Cumulative effects were analyzed on the 29,124-acre cumulative effects analysis area described above in the Analysis Areas portion of this analysis. This scale includes enough area to approximate overlapping home ranges of male and female fishers (Heinemeyer and Jones 1994).

Existing Environment
There are approximately 44 acres (7%) of low quality potential upland fisher habitats and no potential riparian habitats in the project area. Within the cumulative effects analysis area, there are roughly 23,775 acres that would be classified as upland (more than 100 ft from Class 1 and more than 50 feet from Class 2 streams) and 1,729 acres that would be classified as riparian that are associated with the 104 miles of streams in the cumulative effects analysis area. Potential fisher habitats likely exist on a portion of the 9,398 acres (37% of non-DNRC lands) of forested stands with a reasonably closed canopy that are below 6,000 feet in elevation across the cumulative effects analysis area, including roughly 1,606 acres that are in close proximity to the streams in the cumulative effects analysis area. Within the cumulative effects analysis area, fisher habitats are largely absent from the 11,000 acres (43% of non-DNRC lands) of shrubs, herbaceous, and non-forested habitats and is likely fairly limited on the other 4,983 acres (20% of non-DNRC lands) of sparsely stocked and young forest habitats in the cumulative effects analysis area.

Environmental Effects-Fisher

No Action Alternative: Direct and Indirect Effects
No direct and indirect effects to fishers would be anticipated since: 1) no changes to existing habitats would be anticipated; 2) landscape connectivity would not be further altered; 3) no appreciable changes to snags, snag recruits, and coarse woody debris levels would be anticipated; and 4) no changes to public access or the potential for trapping mortality would be anticipated.

No Action Alternative: Cumulative Effects
No further cumulative effects to fishers would be anticipated since: 1) no changes to existing habitats on DNRC-managed lands would occur; 2) any landscape connectivity afforded by the stands on DNRC-managed

lands would not change appreciably; 3) no changes to snags, snag recruits, or coarse woody debris levels would be expected; and 4) no changes to public access or the potential for trapping mortality would be anticipated.

Action Alternative: Direct and Indirect Effects
No riparian habitats within 50 feet of class 2 or 100 feet of class 1 streams would be altered with the proposed activities. Approximately 40 of the 44 acres (91%) of upland fisher habitats in the project area would receive treatments that would reduce canopy closure and would likely be too open to be used by fisher following proposed activities. Proposed planting in fisher habitats would improve future fisher habitats by decreasing the time until those stands provide structural attributes needed by fisher. No changes in open roads would be anticipated; a slight increase in non-motorized access could occur with the proposed construction of 2.1 miles of restricted road. Trapping pressure and the potential for fisher mortality could remain similar to present levels. Minor reductions in landscape connectivity could occur with the proposed activities, but activities would avoid riparian areas commonly used by fisher. Thus, a minor risk of adverse direct and indirect effects to fisher would be anticipated since: 1) harvesting would largely avoid riparian areas, but would modify some upland fisher habitats; 2) minor reductions in landscape connectivity would occur, but those areas associated with riparian areas would largely remain unaffected; 3) harvesting would reduce snags and snag-recruitment trees while increasing coarse woody debris levels; however, some of these resources would be retained; and 4) no changes in legal motorized human-access levels would be anticipated.

Action Alternative: Cumulative Effects
No riparian habitats would be modified and thus the amount of the preferred riparian fisher cover types meeting structural requirements for fishers at the cumulative-effects analysis area would not change. Reductions in upland habitats on DNRC-managed lands (40 acres) would further reduce the amount of suitable upland fisher habitats in the cumulative effects analysis area. These reductions would be additive to the losses associated with past timber harvesting and wildfires in the cumulative-effects analysis area as well as any ongoing harvesting. No appreciable changes to landscape connectivity would be anticipated, and activities would avoid riparian areas commonly used by fisher. No changes in legal, motorized public access would occur. Minor increases in non-motorized access could occur. Overall no appreciable changes in human disturbance and potential trapping mortality would be anticipated. Thus, a minor risk of adverse cumulative effects to fisher would be anticipated since: 1) harvesting would modify some upland fisher habitats, but upland habitats would persist; 2) no appreciable changes in landscape connectivity would be anticipated and connectivity in riparian areas would not be appreciably altered; 3) harvesting in a relatively small portion of the cumulative-effects analysis area would partially reduce snags and snag recruits, while increasing the coarse woody debris levels, largely in the smaller-sized pieces; and 4) no changes to legal, motorized public access would occur.

FLAMMULATED OWLS

Issue
Proposed activities may alter flammulated owl habitat by reducing canopy closure and increasing tree spacing, and could remove snags needed by flammulated owls for nesting.

Introduction
Flammulated owls are tiny, migratory, insectivorous forest owls that inhabit old, open stands of warm-dry ponderosa pine and cool-dry Douglas-fir forests in the western United States and are secondary cavity nesters. In Montana flammulated owls appear to initiate nesting later than most of the other owl species; they generally initiate nesting in May, and nestlings usually fledge during August. In general, preferred habitats have open to moderate canopy closure (30-50 percent) with at least 2 canopy layers, and are often near small clearings. They usually nest in cavities excavated by pileated woodpeckers or northern flickers in 12-25" dbh ponderosa pine, Douglas-fir, or aspen. Without disturbance, Douglas-fir encroach upon ponderosa pine stands resulting in increased stand density and decreased habitat quality for flammulated owls. Periodic, low-intensity underburns

can increase habitat suitability and sustainability by reducing the density of understory seedlings and saplings, stimulating shrub growth, and by protecting large dominant trees from ladder fuels and competition with other mature trees.

Analysis Area
Direct and indirect effects were analyzed for activities conducted in the 640-acre project area. Cumulative effects were analyzed on the 5,791-acre cumulative effects analysis area described above in the Analysis Areas portion. This area includes enough area to support several pairs of flammulated owls (McCallum 1994).

Existing Environment
There are approximately 529 acres (83%) of potential flammulated owl habitats in ponderosa pine and dry Douglas-fir stands across the project area. Some suitable habitats likely exist on a portion of the 4,176 acres (81% of non-DNRC-managed lands) of open and closed forested habitats on other ownerships in the cumulative effects analysis area; however, like the project area, portions of these forested areas are not likely preferred flammulated owl habitat types. A sizable portion of the cumulative effects analysis area has been harvested in the relatively recent past, potentially improving flammulated owl habitat by creating foraging areas and reversing a portion of the Douglas-fir encroachment and opening up stands of ponderosa pine; however retention of large ponderosa pine and/or Douglas-fir was not necessarily a consideration in some of these harvest units, thereby minimizing the benefits to flammulated owls. Modern fire suppression has allowed Douglas-fir in-growth to create denser stands of ponderosa pine and Douglas-fir in portions of the cumulative effects analysis area, which has reduced habitat quality for flammulated owls.

Environmental Effects-Flammulated Owl

No Action Alternative: Direct and Indirect Effects
Existing flammulated owl habitats in the project area would persist. Thus, a negligible risk of adverse direct and indirect effects to flammulated owls would be anticipated since: 1) no disturbance to flammulated owls would be anticipated; and 2) no changes to potential nesting habitats would be anticipated.

No Action Alternative: Cumulative Effects
Existing flammulated owl habitats would persist. Thus, a negligible risk of adverse cumulative effects to flammulated owls would be anticipated since: 1) no disturbance to flammulated owls would be anticipated; and 2) no changes to potential nesting habitats would be anticipated.

Action Alternative: Direct and Indirect Effects
Flammulated owls can be tolerant of human disturbance (McCallum 1994), however the elevated disturbance levels associated with proposed activities could negatively affect flammulated owls should activities occur when flammulated owls are present. Proposed activities could overlap the nesting and fledging periods. Since most snags would be retained, loss of nest trees would be expected to be minimal. Proposed activities on 277 acres of potential flammulated owl habitats (52% of the habitats in the project area) would open the canopy while favoring western larch, ponderosa pine, and Douglas-fir. Elements of the forest structure important for nesting flammulated owls, including snags, coarse woody debris, numerous leave trees, and snag recruits would be retained in the proposed units. The subsequent regeneration in the existing habitats would likely be beneficial for flammulated owls as potential foraging habitats. The more open stand conditions, the retention of fire adapted tree species, and the maintenance of snags would move the project area toward historical conditions, which is preferred flammulated owl habitat. The proposed planting within flammulated owl habitat types could improve future habitat quality. Thus, a minor risk of adverse direct and indirect effects would be expected to flammulated owls since: 1) the potential exists to disturb flammulated owls; 2) proposed planting could lessen the duration before these affected stands are again suitable for flammulated owl use; and 3) harvesting would open denser stands up while retaining elements of forest structure used for foraging and nesting by flammulated owl, improving overall flammulated owl habitat conditions in the project area.

Action Alternative: Cumulative Effects
Disturbance in flammulated owl habitats would be possible on a small portion of the cumulative effects analysis area. Proposed harvesting would increase the amount of the cumulative effects analysis area that has been recently harvested, which would add to the amount of foraging habitats available, but possibly at the expense of losing snags and large trees important for nesting. Overall no change in the amount of potential flammulated owl habitats would exist on DNRC-managed lands or any other ownerships; a slight improvement in habitat quality at the cumulative-effects analysis level could be realized with this alternative and the more historic conditions likely after proposed activities. Thus, a negligible risk of adverse cumulative effects to flammulated owls would be expected since: 1) harvesting could disturb flammulated owls in a small portion of the cumulative effects analysis area should activities occur during the period when flammulated owls are in the vicinity; and 2) harvesting would improve the quality and sustainability of flammulated owl habitat on a portion of the cumulative effects analysis area by making this area more representative of historic conditions.

GRAY WOLF

Issue
Proposed activities could displace gray wolves from important habitats, particularly denning and rendezvous sites, and/or alter prey availability.

Introduction
Wolves are a wide-ranging, mobile species that occupy a wide variety of habitats that possess adequate prey and minimal human disturbance, especially at den and/or rendezvous sites. Wolves are opportunistic carnivores that frequently take vulnerable prey (including young individuals, older individuals, and individuals in poor condition). In general, wolf densities are positively correlated to prey densities (Fuller et al. 1992, Oakleaf et al. 2006). In Montana, wolves prey primarily on white-tailed deer and elk (Kunkel et al. 1999, Arjo et al. 2002). Thus, reductions in big game populations and/or winter range productivity could indirectly be detrimental to wolf populations.

Wolves typically den during late April in areas with gentle terrain near a water source (valley bottoms), close to meadows or other openings, and near big game wintering areas. When the pups are 8 to 10 weeks old, wolves leave the den site and start leaving their pups at rendezvous sites while hunting. These sites are used throughout the summer and into the fall. Disturbance at den or rendezvous sites could result in avoidance of these areas by the adults or force the adults to move the pups to a less adequate site. In both situations, the risk of pup mortality increases.

Analysis Area
Direct and indirect effects were analyzed for activities conducted in the 640-acre project area. Cumulative effects were analyzed on the 29,124-acre area described above in the Analysis Areas portion of this analysis. This scale includes enough area to support at least 1 pack of wolves.

Existing Environment
The project area is in the vicinity of the Petty Creek wolf pack. In general, some wolf use of the project area is possible. Several landscape features commonly associated with denning and rendezvous sites occur in the project area, such as areas near a water source and areas that are close to big game winter ranges. No known den or rendezvous sites occur in the project area, but some use of the project area by wolves could occur for breeding, hunting, or other life requirements. Big game species exist in the vicinity of the project area much of the non-winter period. Big game winter range exists in the project area.
Within the cumulative-effects analysis area, big game species are fairly common and winter range for deer and elk are fairly widespread in the lower elevation areas. Roughly 10,828 acres of winter range (37% of the cumulative effects analysis area) exist in the cumulative effects analysis area; at least 10,855 acres (38%) of

the cumulative effects analysis area appears to have sufficient canopy closure to provide thermal cover and snow intercept for big game. Numerous landscape features commonly associated with denning and rendezvous sites, including meadows and other openings near water, near big game winter range, and in gentle terrain, occur in the cumulative-effects analysis area. Past timber management, wildfires, and human developments have altered big game and wolf habitats in the cumulative effects analysis area.

Environmental Effects-Gray Wolf

No Action Alternative: Direct and Indirect Effects
Negligible direct and indirect effects would be expected to gray wolves since: 1) no changes in human disturbance levels would occur; and 2) no appreciable changes to prey availability would occur.

No Action Alternative: Cumulative Effects
Big game winter ranges would not be affected and substantive changes in big game populations, distribution, or habitat use would be not anticipated. Levels of human disturbance would be expected to remain similar to present levels. Past harvesting and any ongoing harvesting may cause shifts in big game use and, subsequently, gray wolf use, of the cumulative-effects analysis area; however, no further changes would be anticipated that would alter levels of gray wolf use of the cumulative-effects analysis area. Thus, no further cumulative effects to gray wolves would be expected since: 1) no changes in human disturbance levels would occur, particularly near known wolf den and/or rendezvous sites; and 2) no changes to prey availability would occur.

Action Alternative: Direct and Indirect Effects
Wolves using the area could be disturbed by harvesting activities and are most sensitive at den and rendezvous sites, which are not known to occur in the project area or within 1 mile of the project area. If a den or rendezvous site were identified within 1 mile of the project area, a DNRC biologist would be consulted to determine if additional mitigations would be necessary. Proposed activities could occur during the non-winter period when soil moisture conditions permit; given the location of the project area and surrounding landscape, it would be fairly unlikely that any activities would occur during the spring period due to the anticipated snow levels/soil moisture limitations, limiting potential disturbance at den sites and reducing the potential for disturbing rendezvous sites. No changes in legal, motorized public access would occur. After proposed activities, human disturbance levels would likely revert to pre-harvest levels; however increases in restricted roads could increase non-motorized human access and thus a slight increase in potential for disturbance to wolves in the project area. After proposed activities, wolf use of the project area for denning and rendezvous sites would likely revert to pre-harvest levels. In the short-term, the proposed harvesting could lead to slight shifts in big game use, which could lead to a shift in wolf use of the project area. Proposed harvesting activities on approximately 361 acres (56% of the project area) would alter canopy closure, summer big game habitat, and big game winter range habitat. The modifications to summer range could alter some big game use of the project area, and subsequently could alter the use of the project area by wolves. Proposed activities would occur on roughly 361 acres (56%) of elk winter range; proposed activities would reduce canopy closure and potential winter use by big game on roughly 361 (56% of existing stands) that likely have attributes facilitating considerable winter use by big game. Collectively, reductions in big game winter range habitats could redistribute big game, but would not be expected to appreciably alter wolf prey abundance. Thus, a low risk of direct and indirect effects would be expected to gray wolves since: 1) minor increases in human disturbance levels would occur, with no increases near known wolf den and/or rendezvous sites anticipated; and 2) changes to big game summer habitats and winter range could alter big game use of the project area, but would not appreciably alter prey availability.

Action Alternative: Cumulative Effects
Disturbance to gray wolves in a portion of the cumulative effects analysis area would be possible, but would only occur for the short-period of time that activities would be occurring. No changes in legal, motorized human

access would be anticipated; minor increases in non-motorized access would be possible. Reductions in big game winter range would occur in a small portion of the cumulative effects analysis area; winter big game survival would not be expected to change appreciably. Reductions in cover in a small portion of the cumulative effects analysis area may cause slight changes in use by deer and elk; however, no appreciable changes in use within the cumulative-effects analysis area would be expected. These reductions in cover would be additive to losses from past timber-harvesting activities and recent wildfires as well as any ongoing harvesting in the cumulative-effects analysis area. No substantive change in wolf use of the cumulative-effects analysis area would be expected; wolves could continue to use the area in the long-term. Thus, a low risk of cumulative effects to gray wolves would be expected since: 1) elevated human disturbance levels would be short-lived and negligible changes to long-term disturbance levels would be anticipated with no increases near known wolf den and/or rendezvous sites; and 2) modifications to big game summer range and winter range could alter big game distributions, but no appreciable changes to wolf prey availability would be anticipated.

PILEATED WOODPECKERS

Issue
Proposed activities could reduce suitable nesting and foraging habitat for pileated woodpeckers, which could alter pileated woodpecker use of the area.

Introduction
The pileated woodpecker is one of the largest woodpeckers in North America and excavates the largest cavities of any woodpecker. Preferred nest trees are large diameter western larch, ponderosa pine, cottonwood, and quaking aspen trees and snags, usually 20 inches dbh and larger. Pileated woodpeckers primarily eat carpenter ants, which inhabit large downed logs, stumps, and snags. Aney and McClelland (1985) described pileated nesting habitat as “...stands of 50 to 100 contiguous acres, generally below 5,000 feet in elevation with basal areas of 100 to 125 square feet per acre and a relatively closed canopy.” The feeding and nesting habitat requirements, including large snags or decayed trees for nesting and downed wood for feeding, closely tie these woodpeckers to mature forests with late-successional characteristics. The density of pileated woodpeckers is positively correlated with the amount of dead and/or dying wood in stands (McClelland 1979).

Analysis Area
Direct and indirect effects were analyzed for activities conducted in the project area (640 acres). Cumulative effects were analyzed on the 5,791-acre cumulative effects analysis area described above in the Analysis Areas portion of this analysis. This scale includes enough area to support several pairs of pileated woodpeckers (Bull and Jackson 1995).

Existing Environment
In the project area, potential pileated woodpecker nesting habitat exists on approximately 544 acres (85% of the project area). These habitats are dominated by Douglas-fir, Douglas-fir/ western larch, and ponderosa pine. Additionally, 100 acres (16% of the project area) of sawtimber stands, dominated by Douglas-fir and Douglas fir/western larch exist in the project area, which may be potential foraging habitats. In the cumulative effects analysis area, some suitable habitats likely exist on a portion of the 1,626 acres of reasonably closed forested habitats on other ownerships in the cumulative effects analysis area (32% of non-DNRC lands), and some of the 1,063 acres of moderately stocked forested stands on those other ownerships could also be suitable foraging habitats (21% of non-DNRC lands). Much of the 2,465 acres (48%) of shrubs, herbaceous areas, poorly stocked forested stands, and recently harvested stands on other ownerships in the cumulative effects analysis area is likely to open to be useful to pileated woodpeckers.

Environmental Effects-Pileated Woodpecker

No Action Alternative: Direct and Indirect Effects

A negligible risk of adverse direct and indirect effects to pileated woodpeckers would be expected since: 1) no harvesting would occur; 2) no changes in the amount of continuously forested habitats would be anticipated; 3) no appreciable changes to existing pileated woodpecker habitats would be anticipated; and 4) long-term, succession-related declines in the abundance of shade-intolerant tree species, which are valuable to pileated woodpeckers, would be anticipated.

No Action Alternative: Cumulative Effects

No disturbance of pileated woodpeckers would occur. Continued use of the cumulative-effects analysis area by pileated woodpeckers would be expected at similar levels as presently occurring. Thus, a negligible risk of adverse cumulative effects to pileated woodpeckers would be expected since: 1) no further changes to existing habitats would occur; 2) no further changes to the amount of continuously forested habitats available for pileated woodpeckers would be anticipated; and 3) long-term, succession-related changes in the abundance of shade-intolerant tree species, which are valuable to pileated woodpeckers, would occur.

Action Alternative: Direct and Indirect Effects

Pileated woodpeckers can to be tolerant of human activities (Bull and Jackson 1995), but might be temporarily displaced by any proposed activities that could occur during the nesting period. Harvesting would reduce forested habitats for pileated woodpeckers in the project area. Roughly 348 acres (64%) of the potential nesting habitat along with 12 acres (12%) of potential foraging habitats would be largely removed with proposed treatments. Some of these acres could be dense enough to receive some use by foraging pileated woodpeckers following proposed treatments, but most of these stands would be temporarily unsuitable for pileated woodpeckers due to the openness of the stands following proposed treatments. Quality of these potential pileated woodpecker habitats would be reduced for 20-40 years, depending on the density of trees retained. Elements of the forest structure important for nesting pileated woodpeckers, including snags, coarse woody debris, numerous leave trees, and snag recruits would be retained in the proposed harvest areas. Since pileated woodpecker density is positively correlated with the amount of dead and/or dying wood in a stand (McClelland 1979), pileated woodpecker densities in the project area would be expected to be reduced on 361 acres. The silvicultural prescriptions would retain healthy western larch, ponderosa pine, and Douglas-fir while promoting the growth and/or regeneration of many of these same species, which would benefit pileated woodpeckers in the future by providing nesting, roosting, and foraging habitats. Similarly, the proposed planting could improve potential pileated woodpecker habitat quality into the future. Thus, a moderate risk of adverse direct and indirect effects to pileated woodpeckers would be anticipated since: 1) harvesting would reduce the amount of continuous-forested habitats available; 2) potential nesting habitats and foraging habitats would be removed; 3) snags and snag recruits would be removed; however, mitigation measures to retain some snags and snag recruits would be included, and 4) proposed treatments would promote seral species in the project area.

Action Alternative: Cumulative Effects

Reductions in pileated woodpecker habitat quality and the amount of continuously forested habitats available for pileated woodpeckers would occur. On DNRC-managed lands, roughly 196 acres (36%) of pileated woodpecker nesting and 88 acres (88%) of foraging habitats would not be altered; no changes to the existing habitats on other ownerships would be anticipated. Snags, coarse woody debris, and potential nesting trees would be retained in the project area; however, future recruitment of these attributes may be reduced in a portion of the area by the proposed activities. Modifications to pileated woodpecker habitats under this alternative would be additive to habitat losses associated with past harvesting; continued use of the cumulative effects analysis area would be anticipated, but likely at a slightly reduced level. Continued maturation of stands across the cumulative-effects analysis area would provide future pileated woodpecker habitats. Thus, a moderate risk of adverse cumulative effects to pileated woodpeckers would be anticipated since: 1) harvesting

would reduce the amount of continuous forested habitats available in the cumulative-effects analysis area; 2) potential nesting and foraging habitats would be modified, but some habitats would persist in the cumulative-effects analysis area; 3) snags and snag recruits would be removed; however, mitigation measures would retain some of these attributes; and 4) proposed treatments would promote seral species in a portion of the cumulative effects analysis area.

Other Species

RED-TAILED HAWK

Issue
Proposed activities could disturb nesting red-tailed hawks and/or modify nesting habitats for red-tailed hawks.

Introduction
Red-tailed hawks are fairly common birds of prey. They use a wide variety of open to semi-open habitats, including: grasslands, rangelands, deserts, forests, woodlands, agricultural fields, and urban areas. In general, red-tailed hawks prefer a mixture of forests and fields or other open habitats and generally avoid dense, unbroken forested habitats. Red-tailed hawks are opportunistic hunters with a diet consisting mainly of small mammals up to the size of a rabbit, but may also include birds and reptiles. Breeding begins in March and young fly in June or July. The nest is in a tall tree in or at the edge of woodlands near an open area. Nesting territories range from 0.5 to 3 square miles.

Analysis Area
Direct and indirect effects were analyzed for activities conducted in the project area (640 acres). Cumulative effects were analyzed on the 5,791-acre cumulative effects analysis area described above in the Analysis Areas portion of this analysis. This scale includes enough area to support a pair of red-tailed hawks.

Existing Environment
An active nest was located in the eastern portion of the project area and red-tailed hawks were documented in the project area and cumulative effects analysis area on numerous occasions. The stands in the project area likely provide suitable nesting structure and habitats for a suite of potential prey species using forested habitats. In the cumulative effects analysis area habitats for red-tailed hawks likely exists on some of the 1,063 acres of moderately stocked forested stands (21% of non-DNRC lands) and much of the 2,465 acres (48%) of shrubs, herbaceous areas, poorly stocked forested stands, and recently harvested stands on other ownerships in the cumulative effects analysis area.

Environmental Effects-Red-tailed Hawk

No Action Alternative: Direct and Indirect Effects
Existing red-tailed hawk habitats in the project area would persist. No disturbance to red-tailed hawks would occur. Thus, a negligible risk of adverse direct and indirect effects to red-tailed hawks would be anticipated since: 1) no harvesting would occur and 2) long-term, succession-related declines in foraging habitats would be anticipated.

No Action Alternative: Cumulative Effects
No further changes to existing red-tailed hawk habitats would occur. Recent timber management in the cumulative effects analysis area has potentially improved red-tailed hawk habitats by creating foraging habitats and reversing a portion of the Douglas-fir encroachment. Areas exhibiting mature forested conditions would be expected to persist and would not be expected to provide high quality red-tailed hawk habitats into the future.

Thus, a negligible risk of adverse cumulative effects to red-tailed hawks would be anticipated since: 1) no harvesting would occur and 2) long-term, succession-related declines in foraging habitats would be anticipated.

Action Alternative: Direct and Indirect Effects
Some disturbance of red-tailed hawks could occur if activities were conducted during the nesting season; red-tailed hawks are sensitive to human disturbance during the breeding season and are known to change their home ranges to accommodate the disturbance (Andersen et al. 1990). Proposed timber harvest on 361 acres would open the canopy while favoring ponderosa pine, western larch, and Douglas-fir, which could improve red-tailed hawk foraging habitats in the project area. The nest tree and several perch trees within 100 yards of the nest tree would not be harvested and a seasonal restriction limiting activities during the nesting season (April 1 - August 1) would be implemented for areas within 0.25 miles of the nest during years when the nest is active. Thus, minor positive direct and indirect effects would be expected to red-tailed hawks since: 1) harvesting would open denser stands up, improving foraging habitats; 2) proposed activities would revert succession-related declines in habitat quality; 3) nest trees and several perch trees would be retained; and disturbance would be minimized during the nesting season.

Action Alternative: Cumulative Effects
Proposed harvesting would increase the amount of the cumulative-effects analysis area that has been recently harvested. Overall a slight improvement in habitat quality at the cumulative-effects analysis level could be realized with this alternative. Thus, negligible beneficial cumulative effects to red-tailed hawks would be expected since: 1) harvesting would improve the quality and sustainability of red-tailed hawk habitat on a portion of the cumulative effects analysis area; 2) a small increase in the amount of the cumulative-effects analysis area would be anticipated that would be more representative of historic conditions; 3) nest trees and several perch trees would be retained; and disturbance would be minimized during the nesting season.

BIG GAME

BIG GAME WINTER RANGE

Issue
Proposed activities could remove forest cover on big game winter range, which could reduce the carrying capacity of the winter range

Introduction
Winter ranges enable big game survival by minimizing the effects of severe winter weather conditions. Winter ranges tend to be relatively small areas that support large numbers of big game, which are widely distributed during the remainder of the year. These winter ranges have adequate midstory and overstory to reduce wind velocity and intercept snow. The effect is that temperatures are moderated and snow depths are lowered, which enables big game movement and access to forage with less energy expenditure than in areas with deeper snow and colder temperatures. Snow depths differentially affect big game; white-tailed deer are most affected, followed by mule deer, elk, and then moose. Thus, removing cover that is important for wintering big game through forest management activities can increase their energy expenditures and stress in winter, but may increase forage production for use on summer range. Reductions in cover could ultimately result in a reduction in winter range carrying capacity and subsequent increases in winter mortality within local big game herds.

Analysis Area
Direct and indirect effects were analyzed for activities conducted in the 640-acre project area. Cumulative effects were analyzed on the combined winter ranges in the 29,124-acre cumulative effects analysis area

described above in the Analysis Areas portion of this analysis. This scale includes enough area to support a couple of elk herds.

Existing Environment
Montana Department of Fish, Wildlife, and Parks identified mule deer (20 acres) and elk (640 acres) winter range in the project area. These winter ranges are part of larger winter ranges in the area. Mature Douglas-fir and some ponderosa pine stands in the project area are providing attributes facilitating use by wintering big game. Approximately 640 acres of the project area (100%) appear to be providing snow intercept and thermal cover attributes for big game. Evidence of non-winter use by deer and elk was noted during field visits. Roughly 10,828 acres of winter range (37% of the cumulative effects analysis area) exist in the cumulative effects analysis area; at least 10,855 acres (38%) of the cumulative effects analysis area appears to have sufficient canopy closure to provide thermal cover and snow intercept for big game. In the recent past, timber harvesting and wildfires within this area has reduced thermal cover and snow intercept; ongoing timber management across the winter range could continue altering these attributes while potentially disturbing wintering big game. Portions of the cumulative effects analysis area are in non-forested, herbaceous, or shrub types, which would not be expected to provide thermal cover or snow intercept in the future. Human disturbance within the winter range is associated with residential development, agricultural clearing, recreational use, commercial timber management, and Highway 12.

Environmental Effects-Big Game Winter Range

No Action Alternative: Direct and Indirect Effects
No direct or indirect effects to big game winter range would be anticipated since: 1) no further changes in the amount of mature-forested habitats in the winter range would be anticipated; 2) no further changes in thermal cover and snow intercept would be anticipated; and 3) human disturbance levels would not change.

No Action Alternative: Cumulative Effects
Continued winter use of the larger winter range would be expected. No further changes in thermal cover and snow intercept would be anticipated. Human disturbance levels would be anticipated to continue at current levels. No appreciable changes to big game distribution or habitat use would be anticipated. Thus, no cumulative effects to big game winter range would be expected since: 1) no further changes in the amount of mature-forested habitats in the winter range would be anticipated; 2) no further changes in thermal cover and snow intercept would occur; and 3) human disturbance levels would not change

Action Alternative: Direct and Indirect Effects
Proposed activities would not occur in the winter, thus disturbance to wintering big game would not occur. Proposed activities would not occur on affect existing mule deer winter range; proposed activities could alter habitats on 361 acres (56%) of elk winter range. Canopy closure and potential winter use by big game would be reduced on roughly 361 acres (56%) that likely have attributes facilitating considerable winter use by big game. Following proposed activities, canopy densities in these stands providing snow intercept and thermal cover would be reduced, reducing habitat quality for wintering big game. In general, it could take 40 to 80 years for these stands to regenerate and attain a size capable of providing thermal cover for big game. Proposed activities would not prevent big game movement through the project area appreciably in winter and could stimulate browse production in the units. Proposed planting would not appreciably alter winter range attributes, but could shorten the time before some of these stands provide these attributes to big game in the future. Thus, a minor risk of adverse direct or indirect effects to big game winter range would be anticipated since: 1) little or no disturbance to big game would occur during the winter periods; 2) harvesting would alter a moderate amount of the stands that are providing thermal cover and snow intercept habitats for big game species; and 3) portions of winter ranges for mule deer and elk would be altered.

Action Alternative: Cumulative Effects
Proposed activities would not occur in the winter, thus disturbance to wintering big game would not occur. Similarly, any harvesting that may be occurring in the cumulative effects analysis area could continue altering big game winter range and/or disturbing big game. Proposed activities would reduce canopy closure on 361 acres of winter range (3.3%). Modifications to thermal cover and snow intercept in the project area could further alter the amount of the larger winter range providing these attributes for big game. Continued use of the larger winter range would be expected. Thus, a minor risk of adverse cumulative effects to big game would be anticipated since: 1) no further disturbance to wintering big game would be anticipated; 2) a small percentage of the larger winter range would be altered; 3) availability of lower-quality cover in the vicinity that provides some opportunity for big game should they be displaced.

BIG GAME SECURITY HABITAT

Issue
Proposed activities could remove big game security cover, which could affect hunter opportunity and local quality of recreational hunting.

Introduction
Timber harvesting can increase vulnerability of big game animals by changing the size, structure, juxtaposition, and accessibility of areas that provide security during hunting season (Hillis et al. 1991). As visibility and accessibility increase within forested landscapes, moose, elk and deer have a greater probability of being observed and, subsequently, harvested by hunters, or they may become displaced or reduced in numbers due to lowered effective carrying capacity of the local habitat. Reduced cover attributable to logging and roads can also influence the effective use of habitat for big game species. Big game security habitat are nonlinear blocks of hiding cover that are more than 0.5 mile from open roads and are a minimum of 250 acres in size. For the purpose of this analysis, cover was considered generically as big game cover for deer, elk, and moose. Because elk are highly social, wide-ranging species, providing for their cover needs helps ensure that habitat needs for other ungulates, such as deer and moose are met as well. Because of their smaller size and behavioral differences, mule deer and white-tailed deer are able to use smaller cover patches more effectively for escape and security. Moose are a solitary, wide-ranging species capable of effectively using relatively small cover patches, and the hunting season for moose is heavily regulated, greatly reducing risk of overharvest by humans. Therefore, for this analysis it is assumed that if available security cover would provide for the needs of elk, it would also generally be adequate to meet the needs of moose, mule deer, and white-tailed deer.

Analysis Area
Direct and indirect effects were considered at the scale of the project area (640 acres). Cumulative effects were analyzed on the 29,124-acre area described above in the Analysis Areas portion of this analysis. This scale includes enough area to support hundreds of elk.

Existing Environment
Hiding cover is abundant in the project area. No open roads exist in the project area; a couple of historic roads that lead into the project area from private property which DNRC does not control access may facilitate illegal motorized access. Non-motorized access to the project area is also fairly limited, with much of it likely originating in this same area to the south of the project area. Approximately 423 acres (66% of the project area) of elk security habitats exist in the project area.

Hiding cover varies within the cumulative effects analysis area with the recent modifications from timber management, wildfires, and other human activities, but the combination of topography, distance from open roads, and the presence of vegetation likely provides adequate cover for elk during the hunting season. In the cumulative effects analysis area, access for recreational hunting is relatively low, with open roads near the edges (approximately 51 miles of open roads, 1.1 miles/sq. mile) that facilitate some access and numerous

restricted roads (roughly 152 miles; 3.3 miles/sq. mile) that could be used for non-motorized use. Within the cumulative effects analysis area, there is a large patches (total of 15,155 acres; 52%) of potential security habitat that extends beyond the cumulative effects analysis area and contributes to a larger block of potential security habitats.

Environmental Effects-Big Game Security Habitat

No Action Alternative: Direct and Indirect Effects
None of the proposed forest management activities would occur in the project area. No risk of adverse direct or indirect effects to security habitat for moose, elk, mule deer, and white-tailed deer would be expected since: 1) no changes in existing security habitat would be anticipated and continued maturation of forest cover would improve big game security habitat; 2) the level of public access to the project area would not change; and 3) no appreciable changes to big game survival would be anticipated.

No Action Alternative: Cumulative Effects
No changes in big game security habitat would be anticipated. Past harvesting and recent wildfires have altered big game security habitat and allowed increased human access; continued maturation in previously harvested stands and burned stands in the cumulative-effects analysis area would improve hiding cover in those areas. No other changes in disturbance and potential mortality due to hunting would be anticipated. Thus, no adverse cumulative effects to big game security habitat would be anticipated since: 1) no reductions in big game security habitat would occur and modest levels of security habitat and hiding cover would persist within the cumulative-effects analysis area; 2) no changes in open roads, motorized access, or public access would occur; and 3) no appreciable changes to big game survival would be anticipated.

Action Alternative: Direct and Indirect Effects
Tree density within proposed units would be reduced on roughly 361 acres, including roughly 326 acres (77% of existing security cover) of forested stands in the project area contributing to big game security habitat. Hiding cover would be reduced within the proposed units, but would improve as trees and shrubs become reestablished in the openings over the next 10-20 years. The retention of structure within proposed units and unharvested areas between the various units would reduce the potential effects of the hiding cover reductions. Slight increases in sight distance would be anticipated. Proposed planting could facilitate future development of hiding cover within some of the proposed units more rapidly than if left to natural regeneration. Overall, changes to sight distance and hiding cover would have minor effects to big game vulnerability risk in the project area. No changes in open roads or motorized access for the general public would occur. During all phases of the project, any roads opened with project activities would be restricted to the public and closed after the completion of project activities. Slight increases in non-motorized access would occur with the proposed construction of approximately 2.1 miles of restricted roads. Numerous contract stipulations would minimize the effect on the existing big game security habitat by prohibiting contractors from carrying firearms while conducting contract operations and prohibiting contractors from accessing restricted areas for other purposes, such as hunting. Collectively, a minor risk of adverse direct and indirect effects to big game security habitat would be anticipated since: 1) reductions to existing hiding cover would reduce the quality of the big game security habitat in the project area; 2) no changes in open roads or motorized access for the general public would be anticipated and minor increases in non-motorized access would occur that would alter hunter access; and 3) negligible changes in big game survival would be anticipated.

Action Alternative: Cumulative Effects
Alterations of cover could reduce the quality of big game security habitat in a small portion of the cumulative effects analysis area. Continued maturation across the cumulative-effects analysis area would improve hiding cover and big game security habitat. No changes in public, motorized access and negligible increases in non-motorized access would be expected, which would not affect big game vulnerability in the cumulative effects analysis area. Negligible effects to big game survival would be anticipated. Thus, a minor risk of adverse

cumulative effects to big game security habitat would be anticipated since: 1) quality of hiding cover in a small portion of the cumulative effects analysis area would be reduced, which would reduce the quality of the big game security habitat, but security habitat and hiding cover would persist in the cumulative-effects analysis area; 2) no changes in open roads or motorized access for the general public would be expected and only negligible increases in non-motorized access would occur that would alter hunter access; and 3) negligible changes in big game survival would be anticipated.

Wildlife Mitigations

- A DNRC biologist will be consulted if a threatened or endangered species is encountered to determine if additional mitigations that are consistent with the administrative rules for managing threatened and endangered species (ARM 36.11.428 through 36.11.435) are needed.

- Motorized public access will be restricted at all times on restricted roads that are opened for harvesting activities; signs will be used during active periods and a physical closure (gate, barriers, equipment, etc.) will be used during inactive periods (nights, weekends, etc.). These roads and skid trails would be reclosed to reduce the potential for unauthorized motor vehicle use.

- Snags, snag recruits, and coarse woody debris will be managed according to *ARM 36.11.411* through *36.11.414*, particularly favoring western larch and ponderosa pine. Clumps of existing snags could be maintained where they exist to offset areas without sufficient snags. Coarse woody debris retention would emphasize retention of downed logs of 15-inch diameter or larger.

- Contractors and purchasers conducting contract operations will be prohibited from carrying firearms while on duty.

- Food, garbage, and other attractants will be stored in a bear-resistant manner.

- Retention of patches of advanced regeneration of shade-tolerant trees, such as sub-alpine-fir and spruce, in units in lynx habitats would break-up sight distances, provide horizontal cover, and provide forest structural attributes preferred by snowshoe hares and lynx.

- Provide connectivity for fisher, Canada lynx, and a host of other species by maintaining corridors of unharvested and/or lighter harvested areas along riparian areas, ridge tops, and saddles.

- Retain red-tailed hawk nest tree and several perch trees within 100 yards of the nest. In any year when the nest is active, restrict harvesting within 0.25 miles of the nest to the non-nesting period (August 1 – April 1) to minimize potential for disturbing the nesting pair.

Wildlife References

Andersen, D. E., O. J. Rongstad, and W. R. Mytton. 1990. Home-range changes in raptors exposed to increased human activity levels in southeastern Colorado. Wildlife Society Bulletin 18:134-142.

Aney, W. and R. McClelland. 1985. Pileated Woodpecker Habitat Relationships (revised). Pages 10-17 in Warren, N. eds. 1990. Old Growth Habitats and Associated Wildlife Species in the Northern Rocky Mountains. USFS, Northern Region, Wildlife Habitat Relationships Program R1-90-42. 47pp.

Arjo, W. M., D. H. Pletscher, and R. R. Ream. 2002. Dietary Overlap between Wolves and Coyotes in Northwestern Montana. Journal of Mammalogy. 83:754-766.

Banci, V. 1994. Wolverine. Pp 99-127 in L. F. Ruggiero, K. B. Aubry, S. W. Buskirk, L. J. Lyon, and W. J. Zielinksi, editors. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the western united States. USDA Forest Service Rocky Mountain Forest and Range Experiment Station, General Tech. Report RM-254, Fort Collins, Colorado, USA.

Bull, E. L., and J. A. Jackson. 1995. Pileated woodpecker: Dryocopus pileatus. American Ornithologists' Union. Washington DC. 24pp.

Buskirk, S.W., and R.A. Powell. 1994. Habitat ecology of fishers and American martens. Pages 283-296 *in* Buskirk, S.W., A. Harestad, M. Raphael, eds. Biology and conservation of martens, sables and fishers. Cornell University Press, Ithaca, NY.

Copeland, J. P., K.S. McKelvey, K.B. Aubry, A. Landa, J. Persson, R.M. Inman, J. Krebs, E. Lofroth, H. Golden, J.R. Squires, A. Magoun, M.K. Schwartz, J. Wilmot, C.L. Copeland, R.E. Yates, I. Kojola, and R. May. 2010. The bioclimatic envelope of the wolverine (*Gulo gulo*): do climatic constraints limit its geographic distribution? Can. J. Zool. 88: 233-246.

Foresman, K.R.. 2012. Mammals of Montana. Mountain Press Publishing Company, Missoula Montana. 430pp.

Fischer, W.C., and A.F. Bradley. 1987. Fire ecology of western Montana forest habitat types. USDA Forest Service, General Technical Report INT-223. 95pp.

Fuller, T. K., W. E. Berg, G. L. Radde, M. S. Lenarz, and G. B. Joselyn. 1992. A History and Current Estimate of Wolf Distribution and Numbers in Minnesota. Wildlife Society Bulletin 20:42-55.

Green, P., J. Joy, D. Sirucek, W. Hann, A. Zack, and B. Naumann. 1992. Old-growth forest types of the Northern Region. R-1 SES. Unpublished report on file at US Forest Service, Northern Region, Missoula, MT. 60pp.

Heinemeyer, K. S., and J. L. Jones. 1994. Fisher biology and management in the western United States: A literature review and adaptive management strategy. USDA Forest Service, Northern Region, Missoula, Montana. 108pp.

Hillis, J.M., and M.J. Thompson, J.E. Canfield, L.J. Lyon, C.L. Marcum, P.M. Dolan, and D.W. McCleerey. 1991. Defining elk security: the Hillis paradigm. Pages 38-43 in A.G. Christensen, L.J. Lyon, and T.N. Lonner, comps., Proc. Elk Vulnerability Symp., Mont. State Univ., Bozeman, Montana. 330pp.

Hornocker, M. and H. Hash. 1981. Ecology of the wolverine in northwestern Montana. Journal of Wildlife Management 44(3):1286-1301.

Johnson, S. 1984. Home range, movements, and habitat use of fishers in Wisconsin. M.S. Thesis, University Wisconsin, Stevens Point. 78pp.

Jones, J.L. 1991. Habitat use of fisher in north-central Idaho. M.S. Thesis, University of Idaho, Moscow, Idaho. 147 pp.

Kunkel, K., T.K. Ruth, D.H. Pletscher, and M.G. Hornocker. 1999. Winter Prey Selection by Wolves and Cougars in and near Glacier National Park, Montana. Journal of Wildlife Management 63:901-910.

McCallum, D. A. 1994. Review of technical knowledge: flammulated owls. Pages 14-46 *in* G. D. Hayward and J. Verner, tech eds. Flammulated, boreal, and great gray owls in the United States: a technical conservation assessment. USDA Forest Service Gen. Tech. Rep. RM-253. Fort Collins, Colorado.

McClelland, B.R. 1979. The pileated woodpecker in forests of the Northern Rocky Mountains. Pages 283-299 *in* Role of insectivorous birds in forest ecosystems. Academic Press.

Oakleaf, J.K., D. L. Murray, J. R. Oakleaf, E. E. Bangs, C. M. Mack, D. W. Smith, J. A. Fontaine, M. D. Jimenez, T. J. Meier, and C. C. Niemeyer. 2006. Habitat Selection by Recolonizing Wolves in the Northern Rocky Mountains of the United States. Journal of Wildlife Management 70:554-563.

Pfister, R., B. Kovalchik, S. Arno, and R. Presby. 1977. Forest Habitat Types of Montana. USDA Forest Service General Technical Report INT-34. Intermountain Forest and Range Experiment Station Ogden, UT. 174pp.

Powell, R. 1982. The fisher: National history, ecology, and behavior. University of Minnesota Press, Minneapolis, Minnesota. 217pp.

Powell, R. A. and W. J. Zielinski. 1994. Fisher. Pages 38-73 in Ruggiero, L. F., K. B. Aubry, S. W. Buskirk, L. J. Lyon, and W. J. Zielinski, tech eds. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the western United States. USDA Forest Service Gen. Tech. Rep. RM-254. Fort Collins CO.

Ruediger, B., J. Claar, S. Mighton, B. Nanaey, T. Tinaldi, F. Wahl, N. Warren, D. Wenger, A. Williamson, L. Lewis, B. Holt, G. Patton, J. Trick, A. Vandehey, and S. Gniadek. 2000. Canada Lynx Conservation Assessment (2nd Edition). USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service. Missoula, MT. 122 pp.

Squires, J.R., N.J. DeCesare, J.A. Kolbe, and L. F. Ruggiero. 2010. Seasonal resource selection of Canada lynx in managed forests of the Northern Rocky Mountains. Journal of Wildlife Management 74:1648-1660.

Squires, J. R., N. J. DeCesare, J. A. Kolbe, and L. F. Ruggiero. 2008. Hierarchical den selection of Canada lynx in western Montana. Journal of Wildlife Management 72:1497–1506.

Weir, R.D. and F. B. Corbould. 2010. Factors affecting landscape occupancy by fishers in north-central British Columbia. Journal of Wildlife Management 74:405-410.

Wittinger, W.T. 2002. Grizzly bear distribution outside of recovery zones. Unpublished memorandum on file at USDA Forest Service, Region 1. Missoula, Montana.2pp.

Attachment D – Soil Analysis

Clark Creek Timber Sale – Soils

Analysis Prepared By: Jeff Collins, Hydrologist/Soil Scientist DNRC

Introduction

The following analysis will describe the existing soil conditions and the anticipated effects to soil resources and noxious weeds within the Clark Creek project area. Direct, indirect, and cumulative effects to soil resources and noxious weeds of both the No-Action and Action alternatives will be analyzed.

Issues

Soil Resources – There is a concern that forest management activities may result in increased erosion and reduced soil productivity where excessive disturbance from compaction, displacement, or loss of nutrients occurs, depending on the extent and degree of harvest related soil effects.

Regulatory Framework

The following plans, rules, and practices have guided this projects planning and/or would be implemented during project activities:
All applicable Best Management Practices, State Forest Land Management rules and regulations, and measures outlined in the DNRC Habitat Conservation Plan would be implemented. This includes, but is not limited to silviculture considerations for sustained forest growth (ARM 36.11.420) and biodiversity. As required by ARM 36.11.410 and 36.11.414, adequate vegetative debris shall be left on site to support nutrient conservation whole tree skidding shall be discouraged unless mitigation measures are taken to retain a portion of (fine litter) nutrients on site. The proportions of vegetative materials retained are based on the range of comparable levels determined by Graham et al (1994).

Analysis Methods & Analysis Areas

The methods for disclosing impacts for this analysis include using general soil descriptions and management limitations and then qualitatively assess the risk of negative effects to soil productivity from compaction, displacement and erosion from each alternative.

The soils analysis included an evaluation of Missoula County Soil Survey data, air photos, past harvest designs and on-site field reviews by DNRC hydrologist/soil scientist. For the purposes of this analysis, minor soils of 5% or less of the area were grouped based on slope, soil properties and interpretations. Field reviews were conducted to verify the soil properties and current conditions to assess past and predicted effects based on DNRC soil monitoring results from over 80 DNRC postharvest monitoring projects (DNRC, 2006, 2011). The soil analysis considered soil management interpretations and the physical effects to soils from the area and degree of harvest disturbance associated with skidding and roads. The analysis for soil nutrients considers the area of disturbed surface and the fine litter and coarse woody debris available to supply organic materials to the soil. While the anticipated impacts from each alternative will disclose the direct/indirect effects, the cumulative impacts will be the result of previous and proposed activities.

Direct, Indirect and Cumulative Effects Analysis Areas: The analysis area for geology and soil resources includes the proposed harvest units and locations of existing roads and the new and temporary roads proposed for construction within state parcel Section 16, T12N R22W

Existing Conditions

The bedrock geology in the project area includes Pre-Cambrian age Wallace formation limestones, argillites and quartzites that are mainly well fractured. Calcareous limestone is common in the south half of the section, with less calcareous argillites in the north half. The proposed harvest areas are located on the mountain sideslopes and ridges between the Clark Creek and Graves Creek watersheds. The mountain midslopes and sideslopes are steep and have soils forming in shallow to moderately deep colluvial soils with Gravelly subsoils.

Bedrock outcrops and talus are common on steeper sideslopes and ridges, and generally rippable, although some spot locations may require jackhammer or blasting for road construction where bedrock is exposed. Balanced road cut/fills are practical up to 55% where slope steepness increases the quantity of material excavated. Material exposed by road construction is subject to rock ravel on steep cutbanks and is difficult to revegetate. No especially unusual or unique geologic features occur in the project area. No harvest areas or road locations are located on areas of slope instability and slope stability will be dismissed from further analysis.

Soil map units are derived from the Missoula County Soil Survey and summary properties and management interpretations are displayed on Soil Maps S-1 and described in attached Table S1. On the north and west side of the project section, the southerly aspects in Clark Creek are shallow to moderately deep (Map unit 131/133) Winkler very Graveslly loams and sandy loams on 30-60% slopes. Surface soils are shallow (2-10”) and moderate productivity sites supporting ponderosa pine, Douglas fir, western larch and lodgepole pine. All of the soils in the project have high rock contents that makes the materials stable, resistant to erosion and with high water infiltration properties the exceed precipitation rates. The Winkler soils have high gravel contents, lower fine contents and lower soil moisture retention (3.1” in profile). Competition for moisture from understory vegetation and high solar insolation can constrain conifer growth and regeneration. Conifers are subject to drought stress on these very well drained rocky soils and may have more common root rot incidence (Filip 1989).

Soils on the east half of the project section are Repp Graveslly loams and Beeskove Graveslly loams. Repp very Graveslly loams are on moderate to steep slopes of 30-60%. Repp Map unit 91 is a cool more productive phase (easterly slopes and swales) than Repp map unit 89 that occurs on drier southerly slopes. Both soils have generally deeper surface soils (2-13”) and slightly improved growth than the Winkler soils. Available soil moisture is low (4” in profile) and these soils support ponderosa pine, Douglas-fir and western larch with Grand-fir on Repp 89 cool phase sites.

Beeskove Graveslly sandy loams on 30-60% slopes, cool phase (Map unit 14) mainly occur on the northerly aspects. The 132 map unit soils are similar Winkler very Graveslly sandy loams on 8-30% slopes. Both soils have generally deeper surface soils and improved growth. Available soil moisture is slightly higher (4.6” in profile) and these soils support ponderosa pine, Douglas-fir and western larch. Minor soils in the proposed harvest areas include a shallow reddish, volcanic ash influenced surfaces. Where the volcanic ash soils occur in over 4” depths, potential site growth and seedling establish is improved.

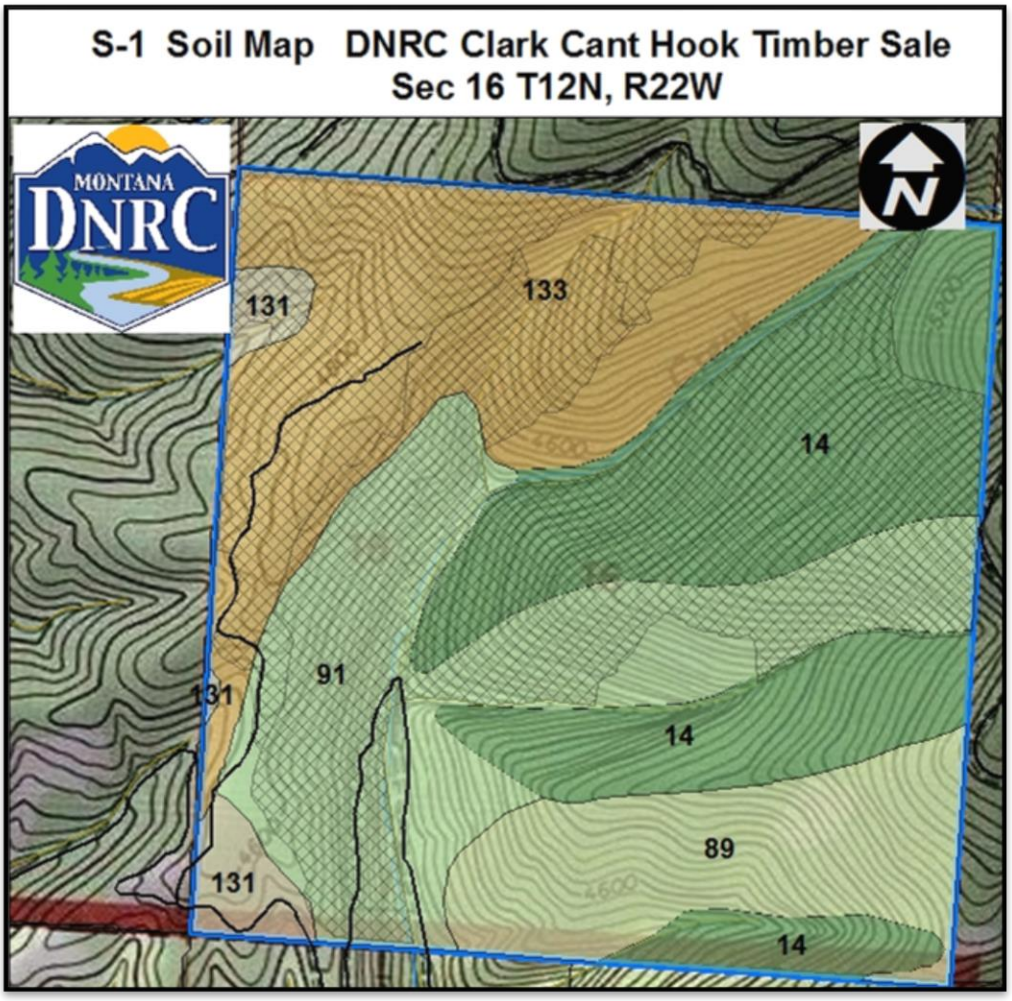
Primary soils concern is avoiding displacement of shallow surface soils. Erosion risk can be effectively controlled with standard drainage practices and implementation of BMPs. Moderate slopes of 30-45% are well

suited to ground based skidding operations and have a long operational season of use, once soils dry out in the spring. Slope steepness over 45% limits tractor operations due to potential for excessive disturbance and erosion. Cable operations on steeper slopes reduce ground disturbance and impacts.

Sediment delivery is concern on the finer textured soils within and adjacent to riparian areas yet can be mitigated by implementation of Streamside Management Zone/ Riparian Management Zone buffer areas and implementation of Best Management Practices (BMPs).

Table S1 Soils Descriptions and Interpretations for Project Section 16, T12N, R22W

Map Unit	Mapping Unit Name	Soil Description	Erosion Potential	Displacement hazard	Compaction Hazard	Site Index Monserud
14	Beeskove Graveslly loam, 30 to 60 percent slopes	Very Gr Loam Colluvium from Calcareous Limestone	Mod to high on slopes >45%	Mod to high on slopes >45%	Mod	Mod Productive soil on site. Limit ground skid to slopes less than <45% **SI 55**
89	Repp very Graveslly loams, 30 to 60 % slopes	Very Gr Loam Colluvium from Calcareous Limestone	Mod to high on slopes >45%	Mod to high on slopes >45%	Mod	Limy soils affect tree rooting and selection Limit ground skid to slopes < 45% **SI 47**
91	Repp very Graveslly loams-Cool Site 30 to 60 percent slopes	Very Gr Loam Colluvium from Calcareous Limestone	Mod to high on slopes >45%	Mod to high on slopes >45%	Mod	Northerly aspect cool and more productive than Repp 89. Limit ground skid to slopes less than 45% **SI 57**
131	Winkler, very Graveslly sandy loams, 30 to 60 % slopes	Shallow-mod deep residuum & colluvium Rock common	Mod, very coarse	Mod to high on slopes >45%	Mod	S. Aspect droughty. Limit ground skid to slopes less than 45% **SI 45**
133	Winkler Graveslly loam, Cool Site, 30 to 60 percent slopes	Shallow-mod deep residuum & colluvium from argillite	Mod, very coarse	Mod to high on slopes >45%	Mod	Cool site slightly more productive than 131 Limit ground skid to slopes <45% **SI 56**



Legend

SYM	Soil Map Unit Name
14	Beeskove gravelly loam, 30 to 60 percent slopes
89	Repp very gravelly loam, 30 to 60 percent slopes
91	Repp very gravelly loam, cool, 30 to 60 percent slopes
133	Winkler gravelly loam, cool, 30 to 60 percent slopes
131	Winkler very gravelly sandy loam, 30 to 60 percent slopes
	Clark Creek Proposed Harvest Units

Effects of Past Management

There was a series of Christmas tree permits and timber sales starting in the 1940s and running through the late 1960's. The last management activity was a timber sale that occurred in 1987. Historic harvest effects have largely recovered with vegetation and trees established in secondary trails. A few major skid trails and

landing sites are still apparent and harvest effects are estimated to be less than 5% of the proposed harvest units. Past exploratory mining and placer operations disturbed segments of lower Clark Creek in the 1900's, they have been abandoned.

Nutrient Cycling & Soil Productivity
There are moderate to high levels of existing downed course woody debris across the proposed harvest areas that is representative of woody debris levels on similar vegetation types measured by Graham et al. (1994). Root rot pockets may be a partial result of increased vegetative stress on droughty sites and shallow soils (Filip 1989), or in areas of partial thinning where high stocking levels of Douglas-fir are retained. Infection is more frequent on poor sites with low moisture, and poor fertility than on good sites. Retaining vegetative litter and woody debris helps to control erosion on disturbed sites, provides media for healthy soil fungi, acts as mulch for water retention and conservation of soil nutrients important to tree growth. It is desirable to maintain moderate levels of litter and old and new coarse woody debris (>3" dia.) at 5-15 tons/acre on the harvest units. Retention of well distributed forest cover provides protection from high solar insolation and can help reduce drought stress to improve conifer regeneration.

Environmental Effects on Soils

No Action Alternative: Direct, Indirect, and Cumulative Effects
Implementation of the no-action alternative would result in no soil resource impacts in the project area. Soil resource conditions would remain similar to those described in the existing conditions of this analysis as displayed in Summary Table S-2.

Table S-2 Summary of Soil Impacts by Alternative

Soil Disturbance and Productivity	Impact								Can Impact Be Mitigated?	Comment Number
	Direct				Cumulative					
	No	Low	Mod	High	No	Low	Mod	High		
No-Action										
Physical Disturbance (Compaction and Displacement)		X				X				
Erosion		X				X				
Nutrient Cycling	X				X					
Slope Stability	X				X					
Soil Productivity		X				X				
Action										
Physical Disturbance (Compaction and Displacement)		X	X			X			Y	
Erosion		X				X			Y	
Nutrient Cycling			X			X			Y	
Slope Stability	X				X					
Soil Productivity			X			X			Y	

Action Alternative: Direct and Indirect Effects on Soils
Implementation of the action alternative would be a combination of salvage and sanitation harvest of dead, dying and high-risk trees to reduce competition and improve growth of diverse tree species that are more resistant to root rot. Approximately 361 acres of harvest are proposed on locations outlined on Soil Maps S-1. Tree planting, grass seeding roads and noxious weed management would also occur. The proposed project could construct 2.1 miles of road and complete repairs and maintenance on up to 6.1 miles of road to meet BMPs.

Primary soil concerns related to harvest operations are potential for excessive surface disturbance and to a lesser degree, erosion. To maintain soil productivity, and promote conifer regeneration, BMPs and mitigation measures would be implemented to minimize the area and degree of soil effects associated with harvest operations. Implementation of BMPs and the recommended mitigation measures, has been shown to effectively limit detrimental soil impacts to less than 15% of the harvest units based on DNRC soil monitoring on comparable sites (DNRC 2006, 2011) and recent harvest on nearby sites and the estimated area that may be detrimentally impacted is displayed in table S-3.

All new roads are located on stable terrain and would be constructed to meet Best Management Practices. The 2.1 miles of new road construction would change the land use of the added roads to transportation and disturb up to 8.4 acres of land as noted in table S-3. The actual area disturbed varies with road width and extent of temporary roads that would be reclaimed. Proposed road cross segments existing on shallow soils and fractured bedrock, may experience rock raveling and would require periodic maintenance. The high rock/coarse fragment soils are excessively well drained and durable to road traffic with implementation of standard road drainage features. On existing roads, road maintenance and site specific road reconstruction requirements would be implemented to improve road drainage and control erosion. All new roads would be grass seeded with site adapted grass to speed revegetation and control erosion and weeds.

Table S3 – Detrimental Soil Disturbance for the Action Alternative

Area of Analysis	Total Area (Acres)	Disturbance Rate (%)	Estimated Impacted Area (Acres)
Harvest Units (including landings)	259 acres Cable 102 acres Tractor	Cable up to 8% Tractor up to15%	Cable 20.7 Tractor 15.3
Roads 2.1 miles	8.4	< 1% of project section	8.4
TOTALS	369.4		44.4 acres Average 12% of 369 acres

It is expected that by protecting at least ~80% of a harvest area in non-detrimental soil impacts, soil properties important to soil productivity would be maintained, and the projected impacts are below that range. The estimates of existing impacts are approximately 5% and additional impacts from the proposed operations are expected to add up to average of 12 and not exceed 15% projected. Contract administration would monitor on-going operations to control soil disturbance to avoid excessive impacts and meet silvicultural goals to reduce competition. For all these reasons, there would be moderate risk of direct and indirect effects to geology or soil resources as a result of the proposed action.

Nutrient Cycling & Soil Productivity
Considering nutrient cycling, the level of tree mortality has already caused many needles and fine litter to fall to the forest floor. A substantial proportion of plant available nutrients are retained in the forest floor duff and surface mineral soils, which also provides a mulching cover that retains surface moisture. A substantial portion of fine foliage that has not already fallen would be expected to break off during logging operations. The proposed harvest and slash treatments would be expected to reduce 15 to 20% of the existing coarse and fine woody debris, based on the planned 50% canopy harvest and retaining a proportion of fine materials. On all proposed harvest areas a portion of old and new course woody debris (CWD >3" dia.) at 5-10 tons/acre and fine litter (similar to historic ranges) would be retained as noted in attached mitigations..

Cumulative Effects of the Action Alternative on Soil productivity
Cumulative effects to soils can occur from repeated ground skidding entries into the harvest area and additional road construction, depending on the area included. Previous harvest effects from the more extensive harvest in 1940's were more impactful than current methods, yet the past operations have largely recovered and revegetated with less than 5% impacted including the harvest in 1987.

There would be short to mid-term reductions in fine litter on high priority fuels reduction treatment zones near residences and open roads. Cumulatively over the rotation of the forest stands, the combination of fine litter and coarse woody debris would be expected to maintain surface organic matter that provides media for healthy soil fungi and conserves soil nutrients and moisture important to tree growth and supports long term productivity. Improved tree spacing would reduce competition for nutrients and soil moisture, enhance growth of retained trees, and promote regeneration of conifers as noted in the vegetation section. Based on these factors there is low potential for long term additive cumulative effects to soils with the proposed actions.

Soils Mitigations

The analysis and levels of effects to Soil resources with the Action Alternative are based on implementation of the following mitigation measures.

- DNRC would implement all applicable BMPs, Montana Administrative Rules for Forest Management, and reasonable mitigation and erosion control practices during timber harvest, road maintenance, and road construction and road use activities. The commitments of the DNRC Habitat Conservation Plan (HCP) would be implemented.

- Limit harvest equipment and hauling operations to periods when soils are relatively dry, (less than 20%), frozen or snow covered to minimize soil compaction and rutting, and maintain drainage features. Check soil moisture conditions prior to equipment start-up.

- On tractor harvest units, the logger and sale administrator would agree to a general skidding plan prior to equipment operations to limit trails to 15% or less of the harvest unit. Feller-bunchers may work on slopes up to 45% as long as soil displacement and turning is minimized to prevent excessive disturbance. Slopes over 45% would be cable harvested to reduce soil impacts and improve harvest efficiency.

- Whole tree skidding can reduce slash hazard, but also remove a portion of nutrients from growing sites. Target fine slash and woody debris levels are to retain 5-15 tons/acre well distributed on site while meeting the requirements of the slash law. On sites with lower basal area, retain large woody debris as feasible since it may not be possible to retain 5 tons/acre and the emphasis would be on providing additional CWD in the future. Slash may be placed on main skid trails to protect soils and reduce erosion potential.

- Existing road segments would be improved and maintained in association with the harvest activities. Road improvements would include surface blading and installation of drainage features to control surface erosion and prevent sediment delivery to streams as needed to comply with BMPS, and to protect water quality.

- Harvest operations and road conditions would be monitored as part of the on-going project operations and repairs would be made as needed, including erosion control, culvert cleaning and re-vegetation. If cut-slope or fill-slope slumps occurred on new roads they would be stabilized to control erosion as part of the harvest project.

- New road construction, including drainage features should be completed prior to freezing conditions. Road cutslopes are to be constructed at relatively stable angles as noted in the contract.

References

Filip, G.M., Goheen, D.J., Johnson, D.W. and Thompson, J.H. 1989. Precommercial thinning in a Ponderosa pine stand affected by Armillaria root disease: 20 years of growth and mortality in central Oregon. Western Journal of Applied Forestry 4: 58-59.

Graham, Russell T.; Harvey, Alan, Jurgensen, Martin; Jain,T.; 1994. Managing Coarse Woody Debris in Forests of the Rocky Mountains. Res. Paper INT-RP-477. Ogden, Utah: U.S.D.A., F.S., Intermountain Research Station, 12p.

MT DNRC 2006, Collins, Jeffry, Compiled Soil Monitoring Report on Timber Harvest Projects 1988-2004., Montana Department of Natural Resources and Conservation, Trust Land Management Division, Forest Management Bureau, Missoula, MT.

MT DNRC , Environmental Assessments of the past DNRC timber sales and roadwork including; Greenough T.S., Washoe T.S., Hidden Lake T.S., Jocko Fire Salvage T.S., Kamas T.S., McNamera T.S., and minor salvage permits, Missoula Unit, Southwestern Land Office.

MT DNRC. 2003 Montana Administrative Rules for Forest Management on DNRC Forested Lands. Montana DNRC. Trust Lands Management Division. Helena, MT.

Montana DNRC. 2010, 2012 Multiple reports, Montana Forestry Best Management Practice Audit Reports. Forestry Division. Missoula, MT.

MT DNRC. 2010. DNRC Habitat Conservation Plan, Final EIS Forest Management Bureau Division, Missoula, Montana.

MT DNRC 2011, Schmalenberg, Jeff, Compiled Soil Monitoring Report on Timber Harvest Projects 2007-2011., Montana Department of Natural Resources and Conservation, Trust Land Management Division, Forest Management Bureau, Missoula, MT.

MT DNRC, 2011. Best Management Practices for forestry in Montana. Available online at www.dnrc.mt.gov/forestry/assistance/practices/documents/bmp.pdf; Last accessed August 3, 2012.

NRIS, Montana Natural Resources Information System, Internet database for soils, airphotos, geology, 2013. http://nris.state.mt.us/interactive.html

Sugden, B.D., R. Ethridge, G. Mathieus, P. Heffernan, G. Frank, and G. Sanders. 2012. Montana's forestry best management practices program: 20 years of continuous improvement. J. For. 12-029.

Attachment E – Water & Fisheries Resources Analysis

Water & Fisheries Resources Analysis

Analysis Prepared By: Jeff Collins, Hydrologist/Soil Scientist, DNRC

Introduction

The following analysis will disclose anticipated effects to water and fishery resources within the Belmont project area. The sections on issues & concerns, regulations and mitigations have been combined for water and fishery resources. Direct, indirect, and cumulative effects to water and fisheries resources of both the No-Action and Action alternatives will be analyzed.

Water & Fisheries Resources Issues

The following issue statements were developed from internal and public scoping regarding the effects of the proposed timber harvest and road systems to water resources and fisheries. For specific comments and concerns, refer to the project file.

WATER RESOURCES:

Issues and Concerns- The following issue statements were developed during scoping regarding the effects of the proposed action to water resources:

- Water Quality - There is a concern that the proposed action may cause impacts to water quality and quantity from timber management, road construction, and road use. Cumulative Watershed Effects- There is a concern that the proposed timber harvest may cause or contribute to cumulative watershed impacts as a result of potential increased runoff and sedimentation.

FISHERIES RESOURCES *(including unique, federally listed as threatened or endangered, sensitive, and/or species of special concern):*

Issues and Concerns- The following issue statements were developed during scoping regarding the effects of the proposed action to fisheries resources:

- Cold Water Fisheries-There is a concern the proposed forest management actions may have effects to fisheries due to sediment delivery to streams.

- Fisheries Connectivity- There is a concern that an existing stream crossing within the project area may restrict fish passage.

Regulations, Laws, Rules & Agreements that Apply to Water & Fisheries Resources

The following plans, rules, and practices have guided this projects planning and/or would be implemented during project activities:

Montana Surface Water Quality Regulations

Lolo Creek and its tributary streams in the project analysis areas are classified as B-1 in the Montana Surface Water Quality Standards (ARM 17.30.623). The water quality standards for protecting beneficial uses in B-1 classified watersheds are described in ARM 17.30.623. The B-1 classification is for multiple use waters suitable for; domestic use after conventional treatment, growth and propagation of cold-water fisheries, associated aquatic life and wildlife, agricultural, and industrial uses. Other criteria for B-1 waters include; no increases are allowed above naturally occurring concentrations of sediment, which will prove detrimental to fish or wildlife and a maximum 1 degree Fahrenheit increase above naturally occurring water temperature is allowed within the range of 32 to 66 degrees Fahrenheit.

Naturally occurring includes conditions or materials present from runoff or percolation on developed land, where all reasonable land, soil, and water conservation practices have been applied. Reasonable conservation practices include methods, measures, or practices that protect present and reasonably anticipated beneficial uses. The State has adopted Forestry Best Management Practices BMPs through its Non-point Source Management Plan as the principle means of controlling non-point source pollution from silvicultural activities. Stream temperatures are discussed in the fisheries section. DNRC provides further protection of water quality and sensitive fish through implementation of the Streamside Management Zone (SMZ) Laws and Forest Management Rules.

Water Quality Limited Waterbodies and Beneficial Uses

The Clean Water Act requires development of Total Maximum Daily Loads (TMDL's) that will provide conditions that can support all beneficial uses. A TMDL is a pollutant budget to identify the maximum allowable amounts of specific pollutants (i.e. sediment, nutrients, metals, temperature) that a water body can assimilate without causing water quality standards to be exceeded. DNRC is committed to implementing TMDL mitigations that ensures compliance with water quality standards and protection of beneficial water uses. The middle reach of Lolo Creek (MT 76H005_012 Sheldon Creek to Mormon Creek) is within the Graves's Creek/Lolo Creek HUC 17010205, and is on the State's 303(d) list of impaired waterbodies (DEQ 2014) for not fully supporting aquatic life, yet supports recreation and agricultural beneficial uses. Listed sources are roads, eroding banks, upland erosion and point sources. Drinking water quality was not assessed. Probable causes are physical substrate habitat alterations and sedimentation-siltation. Probable sources are agriculture, silvicultural activities, and streambank modifications. TMDL's are completed and the primary silvicultural strategy is implementation of Best Management Practices needed to rectify impairments as noted in the "Bitterroot Temperature and Turbidity Sediment TMDL's" (DEQ 2011).

Beneficial Uses- Downstream beneficial uses include aquatic life, drinking water, recreation, agriculture and industry. There are no water rights on the state lands parcel proposed for harvest, but there are direct uses of water for livestock grazing. The project section is not located within designated in municipal watersheds.

Montana Streamside Management Zone (SMZ) Law

All rules and regulations pertaining to the SMZ Law will be followed. An SMZ width of 100 feet is required on Class I and II streams when the slope is greater than 35%. As stated in SMZ ARM 36.11.302(ii), where the slope of the SMZ decreases to 15% or less to form a bench that is 50 to100 ft. from the ordinary high water mark and at least 30 ft. wide, the SMZ boundary is located at the edge of the bench nearest the stream. An SMZ width of 50 feet is required when the slope is less than 35%.

DNRC Forest Management Rules and Habitat Conservation Plan (HCP)

All applicable State Forest Land Management rules and regulations regarding watershed and fisheries management will be followed. This includes, but is not limited to rules listed for water quality (ARM 36.11.422), cumulative effects (36.11.423) Riparian Management Zones (RMZ) (A

RM 36.11.425), Fisheries (ARM 36.11.427) and Conservation Strategies outlined in the DNRC Habitat Conservation Plan (HCP 2011) where applicable. As part of ARM 36.11.427(3)(a)(i) and (iv) and ARM 36.11.436, DNRC is committed to designing forest management activities to protect and maintain bull trout, westslope cutthroat trout and all other sensitive fish and aquatic species as noted in the fisheries assessment. DNRC is a cooperator and signator of the Conservation Strategies and Restoration Plans for Bull Trout and Westslope cutthroat trout. Clark Creek and Graves Creek are Class 1 fish bearing streams within the project watersheds. No Bull trout habitat is identified on streams (MFISH 2016) in the project sections or along the access roads.

The HCP requires designation of a Riparian Management Zone along Class 1 fisheries streams based on stand potential tree height and no-harvest within 50 feet of a Class 1 fisheries stream. Clark Creek is a Class 1 fisheries streams and adjacent to proposed harvest units.

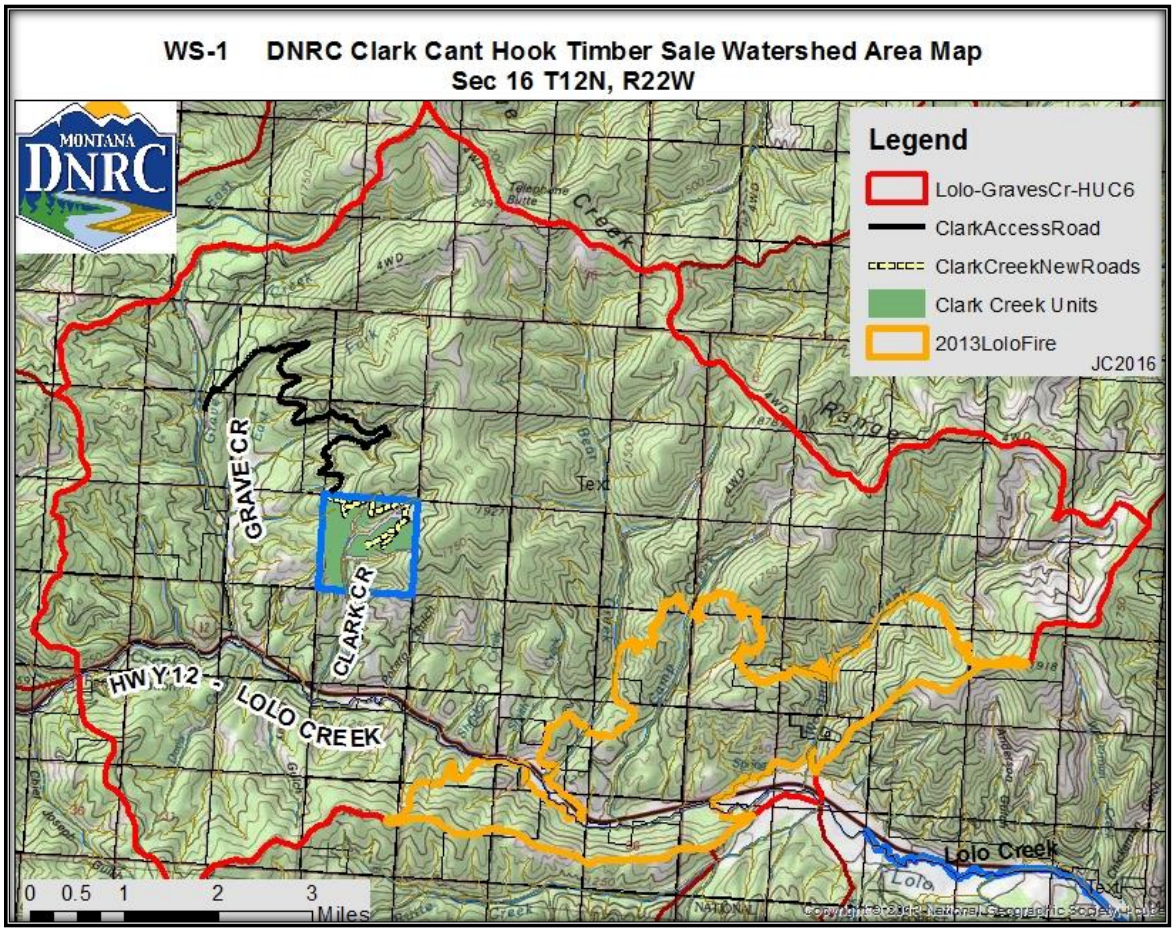
Water Resources Analysis Methods and Areas

A watershed analysis and field survey was completed by a DNRC hydrologist for the proposed project to determine direct, indirect and cumulative effects to water quality. The water quality evaluation included a review of existing inventories for water resources (NRIS 2016, Bitterroot Temperature and Turbidity Sediment TMDL's-DEQ 2011, road inventories, reference to previous DNRC projects, and comparisons of aerial photos combined with GIS analysis to estimate the area of past timber harvest and vegetative recovery. Field reviews were completed for the proposed harvest units, condition of access roads and associated streams and the observations, information and data were integrated into the watershed analysis and design of project mitigations.

Sediment delivery
The analysis areas for sediment delivery are limited to the harvest units and roads used for hauling and will focus on the streams described as affected watersheds (refer to the hydrology map WS-1). A road inventory was completed to identify sediment sources and to design mitigation measures where needed. The analysis includes in-channel and upland sources of sediment that could result from this project. In-channel areas include the stream channels adjacent to and directly downstream of harvest areas. Upland sources include harvest units and roads that may contribute sediment delivery as a result of this project. The measurement criteria for this sediment analysis are 1) miles of new road construction and road improvements/maintenance and 2) potential for sediment delivery to streams.

Water Yield
Cumulative watershed effects can be characterized as impacts on water quality and quantity that result from the interaction of past, current or foreseeable future disturbances, both natural (fire) and human-caused. Past, current, and known future planned activities have been taken into account for the cumulative effects analysis. The analysis for cumulative effects to water yield considers the area of harvest units and access roads within the project drainages described as the affected watersheds. A DNRC hydrologist completed a coarse filter qualitative assessment of watershed conditions and cumulative effects as outlined in the Forest Management Rules (ARM 36.11.423) and the commitments described in the HCP concerning watershed management. Based on extensive past logging in the area, a more detailed assessment of sediment sources and stream channel conditions was also completed. The measurement criteria for the water yield analysis are the potential for increases to surface runoff water yield and affects to stream flow will be described qualitatively considering the distribution and timing of peak flows.

The analysis areas for watershed cumulative effects include the watersheds that wholly surround the DNRC project sections and the access roads to those sections. Past, current, and future planned activities within each analysis area have been taken into account for the cumulative effects analysis.



Affected Watersheds

The watershed analysis areas were designated to evaluate the existing and proposed impacts to water resources associated with the proposed actions. The proposed harvest and access roads are located on mountain slopes west of Lolo, Montana within the Lolo Creek/Graves Creek HUC 170102051408 that is 35,689 acres in size. The proposed harvest area is located within the Montana state trust lands Section 16, T12N, R22W. About 75 acres of section 16 are located in the Graves Creek drainage and the remaining 565 acres of the 640 acre section are located in the Clark Creek drainage. The existing access roads to the project section climb from the Graves Creek road up to the project section within Clark Creek drainage. Refer to the hydrology map WS-1 for analysis areas that include the proposed harvest units and road haul routes. Precipitation occurs mainly as snow, and spring runoff is flashy due in part to considerable shallow rocky soils and steep slopes. The average precipitation for the proposed harvest area is 37”/year in the portion of Graves Creek drainage at the divide with the Clark Creek drainage. The analysis area supports a mixed forest of mainly Douglas-fir, ponderosa pine, lodgepole pine *and western larch. The proposed harvest areas are located in the eastern upper ½ of the drainage.*

The Clark Creek drainage is 1,358 acres in size and 3.1 miles in length, flowing south from its headwaters at 6,320 ft. elevation to the confluence with Lolo Creek (elev. 3,800 ft.). The average annual precipitation for the Clark Creek drainage and the proposed harvest area is 36”/year and the proposed harvest area. Precipitation occurs mainly as snow and spring runoff and is flashy due in part to considerable shallow rocky soils and steep

gradients. The analysis area supports a mixed forest of mainly, Douglas-fir, ponderosa pine, western larch, lodgepole pine and spruce.

Existing Conditions Water Resources

Water Quality and Sediment Delivery
Past management activities in the project area include timber harvest, road construction, fire suppression, mining, rural homes and subdivisions, grazing, and recreation. Streams in the project area were reviewed for channel stability and sediment sources. Clark Creek and Graves Creek are not 303d listed impaired streams and all beneficial uses are currently supported, including fish and aquatic life. Yet there are cumulative effects to water quality within the project drainages that include, past timber harvest, old mining exploration, water diversions, grazing, rural housing, highways, forest roads, segments of poor road locations and substandard crossing sites.

The timber stands are dominated by mixed conifer forests that were largely initiated by fires. Timber harvests started in the late 1800's with mine exploration with some poor road locations and timber harvest practices. Mechanized operations occurred mainly from 1930-2010 and older operations had greater impacts prior to BMP adoption in 1988. There has been past timber harvest on private, Lolo National Forest lands, and State lands that has largely regenerated to young and intermediate conifer forests.

Sediments
Sediment surveys found a moderate direct and indirect impact of sediment sources from forest and mining roads in the analysis areas. Material quality is fair to good throughout the project areas as noted in the soil analysis, except for portions of the existing lower Graves Creek haul roads that cross fine textured soils on the footslopes. Road surface drainage has been installed on most of the existing access roads, yet there are segments that are steep and do not meet BMPs for adequate road surface drainage. There are 6 miles of existing access roads that would be used in the Graves Creek drainage and there are 5 stream crossing sites. The crossing sites are generally well armored with rock around the culvert ends and minor sediment delivery. Two crossings need additional drain-dips prior to the crossing to meet BMPs. There are no existing roads on the State project section 16 within the Graves Creek drainage.

Within the Clark Creek drainage, stream flow is intermittent Class 2 in the north half of the section and perennial flow begins about midpoint in state section 16 on the main stem flowing south. Stream channel stability is generally good to excellent within the section except for a segment of previous mining exploration that occurred over 50 years ago and disturbed portions of the lower channel. The disturbed channel has revegetated with trees and vegetation, and the channel has reestablished. On the State project section 16 there is one existing crossing of the perennial segment of Clark Creek near the south boundary. This culvert is undersized and there is channel scour at the culvert outlet. There is minor sediment delivery from the road surface at the crossing site.

As a general evaluation, the potential for sediment risk increases with area in roads. Existing road density is moderate at 4.2 mi. /sq. mi. across all ownerships in the Clark Creek drainage, and less than 1 mi. /sq. mi. in the state project section. Estimates of road miles were based on field reviews and ARC database files. The proposed harvest would use existing roads in the Graves Creek drainage and there is about 1 mile of existing road along the ridge divide between Graves Creek and Clark Creek drainages. There are no stream crossings or direct sediment sources on this road segment, but some grades are steep and do not have adequate road surface drainage. Current dispersed sediment sources within the drainage are associated with forest roads, grazing and rural homes in the lower drainage.

Water Yield

Tree canopy reduction by timber harvest activities, tree mortality or wildfire can affect the timing of runoff, increase peak flows and increase the total annual water yield of a particular drainage, principally in areas with an average of 30 inches or more of annual precipitation. Moderate to high increases in water yield can increase stream channel scour and in-stream sediments that impact water quality and fish habitat, so we assessed stream channel conditions as part of the project analysis. Water yield can also decline based on forest canopy regrowth that increases precipitation interception and transpiration, which reduces runoff. Snowmelt in the project areas typically begins early in April with peak runoff in May. Snowmelt occurs first and is flashy on the more southerly aspects of Clark Creek. As noted in the soil analysis, soil infiltration rates generally exceed 6 inches/ hour and even in rapid snowmelt, surface runoff generally carries only a short distance before infiltrating into the soil. This moderate potential for runoff is reinforced by moderate precipitation in the area and estimates of Relative Effective Annual Precipitation (REAP) developed by the Montana Natural Resources Conservation Service (NRCS web reference 2015). REAP is an indicator of the amount of moisture available at a location taking into account precipitation, slope, aspect and soil properties and is displayed as a map layer (in project file). The REAP data and climate summary for the project area indicates that effective precipitation is at a deficit in the summer when transpiration exceeds precipitation. Areas of overstocked trees increase competition for limited soil moisture later in the summer.

Historically, tree cover comprised about 65-80% of forest stands in combination with natural openings, talus area and areas in various successional stages after fires, as noted in the vegetation section description. Currently, older lodgepole pine and a portion of ponderosa pine are dead, dying and at risk of mountain pine beetle mortality. Spotty root rot occurrences have also reduced crown canopy of Douglas-fir and the overall stand volume in proposed state lands harvest areas. Insect mortality and root-rot may have resulted in a minor increase in water yield but is partially offset as water yield is also declining in forest stands that have regenerated from previous harvest are near full recovery.

Fire effects would depend on the area and severity of burn that would reduce forest canopy cover. Extreme wildfire may increase runoff and water yield relative to increasing canopy loss. A study by Stednik (1996) found that 15% or more of a watershed must burn to generate a hydrologic response. Within the Lolo/Graves Creek HUC about 4700 acres (13% of the watershed) of mixed severity fire occurred in the Lolo Creek Fire of 2012 that is located several miles downstream from the confluence of Clark Creek with Lolo Creek. The mosaic of mixed burn severity and reductions in foliage cover and snow interception are considered within the range of natural occurrences.

Stream channel conditions were reviewed near and below the proposed harvest areas using the USFS Stream Reach Inventory and Channel Stability Evaluation Procedure (Pfankuch, 1978) and the evaluation rated as good on all streams sites adjacent proposed harvest areas in 2016. Past riparian harvest has occurred in the area across ownerships and along all of the drainages, yet channel morphology is rated as fair to good with extensive vegetation growth along the channels. Primary impacts to stream channel stability in the drainages are grazing and historic/legacy logging and mining disturbances from the 1900's. Past timber harvest was extensive, but has regenerated to sapling, pole and intermediate conifer stands that are largely overstocked. Channel stability is good through the state project section, in part due to the bedrock control of headwaters streams segments, the high amounts of vegetative recovery on channel banks. A comparison of past harvest areas on water yield effects and stream assessments reveals that water yield has had low to moderate impact on channel stability on the project section reaches.

Water yield is not considered constrained in the Clark Creek drainages based on field reviews, review of aerial photos, and stream channel stability ratings near the project sites. Current water yield is estimated at 5.3% increase above a fully forested condition and the allowable water yield was determined to be 12% for the project and relatively small drainage area. The headwaters of Clark Creek including the project section has Rosgen A and B channel types that are very rocky, stable and resilient to increased flows near the project sites

and do not reflect channel effects from increased water yields. Areas of talus rock slides carry to the stream banks in parts of all analysis drainages near the project areas. Overall there are low to moderate cumulative effects to water yield and sediments due to past harvest, roads and fire.

Environmental Effects

No Action Alternative: Direct, Indirect, and Cumulative Effects on Water Quality and Quantity

The No-Action alternative is expected to result in similar moderate direct or indirect and cumulative effects to water quality or quantity as described under the existing conditions and is summarized in table WS-1. Segments of the existing haul roads do not meet BMPs for drainage, and there are moderate cumulative effects of sediment from roads, past harvest, historic mining and grazing. Historic mining effects on sedimentation are on a long term trending improvement as plants continue to revegetate past disturbances. There is minor grazing and effects would be expected to remain the same or slightly decline as grazing management improvements are made consistent with periodic grazing inspections. Sedimentation on segments of existing access roads with inadequate surface drainage would continue to impact water quality unless remedial actions are taken, and any repairs would be completed over time based on priorities with limited funds. There is a concern that more extreme wildfire may occur without better tree spacing by harvest and thinning for fire protection.

Table WS-1 Summary Effects of the Alternatives on Water Quality and Quantity

Water Quality & Quantity	Impact								Can Impact Be Mitigated?
	Direct & Secondary				Cumulative				
	No	Low	Mod	High	No	Low	Mod	High	
No-Action									
Water Quality-Quantity Sediments			X				X		N/A
Water Quantity			X				X		N/A
Action									
Water Quality-Quantity Sediment			X				X		Y
Water Quantity			X				X		Y

Direct and Indirect Effects of the Action Alternative on Water Quality and Quantity

Land management activities such as timber harvest and road construction could impact water quality primarily by accelerating sediment delivery to local stream channels. The primary risk to water quality from this project is sediment delivery at haul road stream crossings and a lesser risk from harvest units. Grazing effects would be expected to remain the same as existing conditions or slightly decline as grazing management improvements are made consistent with periodic grazing inspections.

Implementation of the action alternative is a combination of tree harvest that includes sanitation/salvage harvest of dead, dying and overstocked trees to reduce competition and promote regeneration of diverse conifer species for improved tree growth that are more tolerant of root rot. Approximately 361 acres would be harvested using a combination of cable logging and ground based skidding that would retain well stocked forest sites. The proposed harvest is expected to have low to moderate short term impacts to water resources and water quality and a long term improvement to water quality.

Sediments
There is low potential for off-site erosion from the harvest areas based on the buffer distances to streams, high rock content soils and rapid water infiltration rates that exceed most runoff events. All harvest operations are designed to minimize surface disturbance and potential for erosion and sediment delivery by implementing adequate stream and wetland buffers and would provide adequate protection of water quality. Streamside Management Zones (SMZ's) vary from 50 feet -100 feet from a stream. About 35 acres of Class 1 SMZ and 12 acres of Class 2 SMZ were marked adjacent to proposed harvest units.

Riparian Management Zones (RMZ) would be designated for stream protection where harvest units are adjacent to the class 1 stream segments of Clark Creek (see table WS-4). Within section 2, T12N, R17W Upper Clark has Class 2 perennial flow that sinks subsurface in a large talus slide, thus would not affect water quality lower in the Clark Creek watershed. The RMZ distance is based on stand potential tree height that vary from 90 to 105 feet adjacent to Class 1 streams. As a conservative approach and for ease of layout, all RMZ protective widths were set at 105 feet where proposed harvest units would be adjacent to Class 1 streams. No harvest would occur within the 50 feet of the Class 1 segments of Clark Creek considered supporting fish and all RMZ harvest is planned for low disturbance cable harvest.

Minor individual tree section harvest is planned within the outer edge of 75 to105 foot RMZ of Clark Creek on less than 2 acres. Selection harvest would retain 50% or more representative trees greater than or equal to 8"dbh and retain sub merchantable trees to the fullest extent possible in the RMZ.

The riparian management zones proposed for harvest have well established vegetative buffers, and there is low risk of sedimentation to surface waters from the proposed harvest operations, based on implementation of BMPs and RMZ's to protect water quality (DNRC 2012). Sediment trapping research (Lakel et. al. 2010) on the effectiveness of stream buffers, found that > 97% of erosion was trapped by vegetation prior to entering streams for SMZ's of 25ft or more.

Roads
Implementation of the Action Alternative would use 6 miles of existing haul roads across multiple ownerships, and road drainage would be improved or maintained to comply with BMPs and improve water quality. Extensive planning was completed to optimize use of existing roads and minimize the extent of new roads. The proposed project would construct about 2.1 miles of new road, including connecting roads to improve the transportation routes. All new roads were located on mid to upper side-slopes that are stable and away from surface waters and planned to minimize stream crossings. Road maintenance would be completed on 6.1 miles of road within the Graves Creek drainage to meet BMPs and would reduce sedimentation at 2 existing stream crossing sites. Approximately 0.4 miles of old roads that are currently vegetated would be abandoned to reduce haul road density and maintenance. Within the Clark Creek drainage there is 1 mile of existing road and 2.1 miles of new road minus 0.4 mi abandonment equals an increase of 1.7 mile (0.7 mi. /sq. mi) which would have negligible increase in road density. The haul route would use existing roads within the Graves Creek drainage and construct less than 0.3 miles of new road on a ridge line and no net change in road density.

One undersized stream crossing would be removed in Clark Creek and road drainage would be improved to meet BMPs. All requirements of 124 stream permits, BMPs and site specific erosion control measures would be implemented at the proposed culvert sites to minimize erosion and sediments. There would be short term sediment increases during stream crossing replacements that would result in long term sediment reductions. DNRC turbidity sampling on streams below construction sites, found short duration sediment spikes occurred and quickly declined the same day as operations. All new access routes on state lands would be gated or closed to year round use, which would reduce road damages and sedimentation and there would be no change in open road access. A complete list of mitigations is attached.

All new roads would be grass seeded with site adapted grass to speed revegetation, control erosion and weeds. On the existing haul roads, road maintenance and site specific road reconstruction requirements include culvert cleaning, additional rock armor and sediment control at crossings would be implemented to improve road drainage and reduce potential sediments on existing stream crossing sites.

In summary, there would be reductions in sediments for road repairs and maintenance that would result in long term reductions in sedimentation and overall low to moderate direct and in-direct downstream effects on water quality in these resilient streams.

Cumulative Effects & Water Yield

For this project DNRC determined (per ARM 36.11.423) there was a moderate allowable threshold for increased water yield in the project watersheds to ensure compliance with water quality standards. There is moderate risk of additive cumulative effect to water yield and water quality for the proposed alternative based on mainly moderate harvest intensity coupled with limited new road construction, road abandonment and maintenance/repairs to improve water quality. The proposed harvest is estimated to produce moderate levels of water yield increases and is unlikely to have an measurable adverse effect on stream channel stability or water quality based on the following reasons;

1) The proposed moderate intensity, sanitation/selective harvests would remove stagnant trees and promote codominant and understory trees that use water more efficiently. Removal of dead, dying and poor vigor trees would not measurably contribute to interception or transpiration.

2) The proposed harvest would increase estimated water yield to 12.7% versus 5.3% for no-action. This change is close to the 12% allowable water yield increase calculated for this project and less than what would be expected under a wildfire.

3) Parent materials in streams adjacent to harvest areas are stable with high rock contents, and reflect resilient stream channel morphology. The moderate change in water yields is unlikely to cause a perceptible change to the stream channel stability or cause adverse impacts to channel forms in or directly below the project sections. Over time, the expected improved growth of retained trees and regeneration of more disease tolerant trees should improve stand cover and vigor and further reduce any water yield effects.

4) The proposed actions would implement BMPs, rules and permit requirements including listed mitigation measures and the repair and stabilization of sediment sources to improve long term water quality. Transportation planning is designed to minimize roads and locate new roads well away from water. There would be a minor reduction in road with the abandonment of a stream crossing and short road segment within Clark Creek drainage.

Fisheries Analysis Methods and Areas

This analysis will consider the presence of fish and potential effects of the proposed harvest and use of roads on fisheries resources. Fisheries issues are listed at the beginning of this report including the regulatory framework related to fisheries and the HCP. Fish presence or absence will be based on MTFWP MFISH data as of 2016, and field reviews of the potentially affected streams and access road stream crossing sites on the proposed haul routes.

The analysis area includes the 6th code scale of the Lolo/Graves Creek HUC and more specifically Clark Creek (refer to Water Resources map WS-1). The proposed haul route and harvest areas were identified to evaluate the existing and potential impacts to fisheries on Class 1 fish bearing streams.

Sediment delivery effects to streams and water quality will follow the same analysis as in the water resources report. Sediment will be qualitatively assessed as the potential sediment delivery to fish bearings streams at stream crossings, access roads within the riparian area and on locations that are downslope of harvest areas or areas of soil disturbance.

Riparian Large Woody Debris and Stream Shading- Riparian large woody debris and stream shading concerns and analysis will be limited to the perennial fish bearing stream segment of Clark Creek where selective riparian management harvest is proposed. These issues will be qualitatively addressed with the measurement criteria of extent of stream shading and retention of snags that may fall and be recruitable to stream channels where the large woody debris may support fish habitat diversity.

Fish Habitat Connectivity- The connectivity of stream habitat for fish through stream crossing structures can be restricted by flows or crossing design. This issue will be qualitatively addressed based on fish passage surveys.

Cumulative impacts- are those collective impacts on the human environment of the proposed action when considered in conjunction with other past, present, and future actions related to the proposed action by location or generic type (75-1-220, MCA). The potential cumulative impacts to fisheries resources in the analysis areas are determined by assessing the collective anticipated direct and indirect impacts, other related existing actions, and future actions affecting the fisheries resources.

Regulatory Framework

The following plans, rules, and practices have guided this projects planning and/or would be implemented during project activities:
All applicable Best Management Practices, State Forest Land Management rules and regulations, and measures outlined in the DNRC Habitat Conservation Plan would be implemented. This includes, but is not limited to Fisheries considerations (ARM 36.11.427, 36.11.404-and 36.11.428) for endangered and sensitive species to minimize impacts to fish populations and habitat. DNRC is a cooperator and signator of the Conservation Strategies and Restoration Plans for Bull Trout and Westslope cutthroat trout. The surface waters in the analysis areas are not listed as water quality impaired and fully support beneficial uses and are classified as B-1 in the Montana Surface Water Quality Standards (ARM 17.30.610). Additional details on these regulations, water quality standards, and beneficial uses please refer to the Water Resources analysis for this project.

Existing Conditions- Fisheries

Fish Presence/Absence
Fish presence or absence within the analysis areas are presented in Table FS-1 and based on MTFWP MFISH data and field reviews of the potentially affected streams and access road stream crossing sites on the proposed haul routes. No Bull trout habitat is identified on streams (MFISH 2015) in the project sections or along the proposed access roads or crossing sites.

Existing roads would be used in the Graves Creek drainage. Graves Creek is considered to support cutthroat trout from the mouth on Lolo Creek up through the East fork and unnamed Class 1 perennial stream tributaries that are crossed by the existing access haul route to the state parcel in section 16, T12N, R22W. New roads and harvest units are proposed within the Clark Creek drainage. The segment of Clark Creek where RMZ harvest is proposed is considered a Class 1 fish bearing stream.

Sediment
There are moderate direct and indirect impacts of sediments to water quality in the project area as noted in the water quality section, principally at stream crossing sites with inadequate drainage and sites of legacy roads and mining adjacent to streams. Clark Creek and Graves Creek are not listed as impaired streams and beneficial uses are currently supported, including fish and aquatic life. Clark Creek has sustained flow beginning in the middle of state section 16 and is known to support westslope cutthroat trout in the first stream mile based on stream sampling (MFISH 2016).

There are 6 miles of existing access roads that would be used in the Graves Creek drainage and there are 3 perennial stream crossing sites that may be fish bearing. The crossing sites are generally well armored with rock around the culvert ends and minor sediment delivery. Two crossings need additional drain-dips prior to the crossing to meet BMPs. There are no existing roads on the State project section 16 within the Graves Creek drainage.

Within the Clark Creek drainage, perennial flow that may support fish begins about midpoint in state section 16 on the main stem flowing south. Stream channel stability is generally good to excellent within the section except for a segment of previous mining exploration that occurred over 50 years ago and disturbed portions of the lower channel. The disturbed channel has revegetated with trees and vegetation, and the channel has reestablished. In section 16 there is one existing crossing of the perennial segment of Clark Creek near the south boundary. This culvert is undersized and there is channel scour at the culvert outlet. There is minor sediment delivery from the road surface at the crossing site.

Riparian Large Woody Debris and Stream Shading
Large woody debris and snags within Streamside Management Zones (SMZs) and RMZ's provide stream stability and habitat diversity for fish and aquatic life. Maintaining adequate vegetative shading near streams helps to moderate stream temperatures. There was previous selective harvest of riparian trees over 50 years ago along segments of Clark Creek that flow through section 16, T12N, R22W. The stream banks and RMZ of Clark Creek are well vegetated with riparian shrubs and well distributed mature overstory conifers. A field reconnaissance found there is considerable large woody debris incorporated into the Clark Creek stream channel. An RMZ buffer distance of 105 feet was determined for designation along the proposed harvest units.

Fish Habitat Connectivity
Existing crossings on the haul route across private and Lolo National Forest Lands were not evaluated for fish habitat connectivity as this is a temporary use road and fish presence is unknown on the tributary unnamed tributary streams of Graves Creek. Use of the existing road would have no change on fish habitat connectivity and this issue is dismissed from further evaluation for the Graves Creek temporary road. A DNRC fish passage assessment was completed for the lower Clark Creek crossing in 2005 and found that this one culvert was partially limiting for fish passage in the project section 16, T12N, R22W.

Fishery Resources - Environmental Effects

No Action Alternative: Direct, Indirect, and Cumulative Effects
Implementation of the no-action alternative would result in no additive fisheries resource impacts in the project area and effects would remain similar to those described in the existing conditions and displayed in table FS-1. There are moderate cumulative effects to fisheries from road sediments and crossing limitations to fish passage within the broader Lolo/Graves Creek HUC.

Table FS-1 Summary Effects of the Alternatives on Fishery Resources									
Fishery Resources	Impact								Can Impact Be Mitigated?
	Direct & Secondary				Cumulative				
	No	Low	Mod	High	No	Low	Mod	High	
No-Action									
Water Quality-Quantity Sediments			X				X		N/A
Large Woody debris & Stream Shading		X				X			N/A
Fish Habitat Connectivity			X				X		N/A
Action									
Water Quality- Quantity Sediment Delivery			X				X		Y
Large Woody debris & Stream Shading		X				X			Y
Fish Habitat Connectivity		X				X			Y

Action Alternative: Direct, Indirect, and Cumulative Effects

Implementation of the action alternative is a combination of sanitation and salvage harvest of dead, dying and high-risk trees to reduce competition and improve growth of diverse tree species. The proposed harvest is of moderate intensity on 361acres and maintains all riparian buffers on the project parcel outlined on Map WS-1.

Selection harvest would occur within the 50-105 foot Class 1 RMZ of Clark Creek. It is unknown if fish inhabit this far upstream, but for the purposes of this analysis, we will consider Class 1 stream segments to be fish bearing. Harvest would retain 50% or more of representative trees in the RMZ. All harvest operations are designed to minimize surface disturbance and potential for erosion and sediment delivery.

Sediment Delivery

The primary risk to water quality is expected to be sediment delivery at crossings, since plans are to maintain adequate stream buffers and low disturbance cable operations where harvest units border adjacent to streams. Implementation of the action alternative would utilize about 6 miles of existing gated access haul roads starting at the Graves Creek road and across multiple ownerships. On the existing roads road maintenance site specific road reconstruction requirements and all BMPs would be implemented to improve road drainage and control erosion. Site specific road reconstruction requirements include culvert cleaning, additional rock armor and sediment control at stream crossings to reduce potential sediments and improve long term water quality.

Approximately 2 miles of new road would be constructed away from streams with 2 new crossings on an intermittent, non-fish bearing streams. No new road crossings would be constructed on Class 1 fish bearing streams. An existing undersized culvert in the south ½ of the project section is a minor source of sediment and is planned for removal. During stream crossing installations and the one removal, there would be short term spikes in sediments with moderate direct and in-direct downstream effects on water quality that would quickly subside the same day as operations, based on DNRC monitoring of turbidity during crossing constructions. All requirements of the 124 stream permits, BMPs and erosion control measures would be implemented, at the proposed culvert sites to minimize erosion and sediments.

All new roads would be grass seeded with site adapted grass to speed revegetation to control erosion and sedimentation. Road maintenance and site specific repairs would likely result in short duration, low levels of

sedimentation that would quickly subside and result in a long term reduction in sedimentation and overall water quality improvements to streams compared to no-action.

In summary, for all the reasons described the proposed project has overall low additive direct or indirect impacts to fisheries based on the following: no harvest within 80 feet of Class 1 fishery streams, moderate harvest with cable harvest away from streams, stream channel conditions are stable and resilient, road construction on dry sites with no new stream crossings of fish bearing stream locations, sediments from road repair would be short duration and quickly subside to lower levels than no-action.

Riparian Large Woody Debris and Stream Shading

DNRC would designate a Riparian Management Zone (RMZ) width of 105 feet buffer along a fish bearing reach of the Class 1 stream segments of Clark Creek in the state Section 16, T12N, R22W. The combination of no harvest in the first 80 feet adjacent to Clark Creek and retention of 50% or more of representative trees in the outside 80 to 105 foot RMZ would maintain adequate stream shading and recruitable large woody debris to support channel forms and habitat. There would be low potential for changes in stream temperature with the limited change in tree canopy and stream shading. All RMZ harvest is planned for low disturbance cable harvest.

Fish Habitat Connectivity- Effects

No new stream crossings are proposed on Class 1 fish- bearing stream locations. There is an undersized culvert crossing on Clark Creek in the south half of section that is a partial barrier to fish passage and the culvert is planned for removal. The proposed crossing removal would improve potential fish habitat connectivity in the upper reaches of Clark Creek.

Action Alternative: Cumulative Effects

There would be an overall low risk of additional cumulative impacts to fisheries with the proposed timber harvest and road construction. The moderate levels of harvest, wide effective RMZ buffers and low disturbance cable operations will result in negligible sediment delivery if any to Class 1 segments of Clark Creek. There is low to moderate risk of additive cumulative watershed effects to sediments from increased surface runoff or water yields that may affect flow regimes or channel conditions as a result of this project.

There is a moderate risk of cumulative water quality effects based on short duration sediment increase associated with site specific road repairs, road maintenance and removal of an undersized culvert that partially limits habitat connectivity. The proposed new roads are located well away from streams and no new stream crossings are proposed on fish bearing stream locations. Removal of a fish passage limiting culvert would improve fish habitat connectivity. As detailed in the water resources section, existing road drainage within the project parcels and haul routes would be improved to comply with BMPs, with an emphasis on sediment control at existing stream crossings that would result in a long term slight improvement in water quality. For all these reasons there is low risk of cumulative effect to fisheries from the proposed actions.

Water & Fishery Resource Mitigations

Recommended Mitigation Measures for Water Resources & Fisheries- The analysis and levels of effects to water resources and fisheries resources are based on implementation of the following mitigation measures.

- DNRC would implement all applicable Best Management Practices (BMPs), Montana Administrative Rules for Forest Management, and reasonable mitigation and erosion control practices during timber

harvest, road maintenance, road construction and road use activities. The commitments of the DNRC Habitat Conservation Plan (HCP) would be implemented on the applicable parcels.

- DNRC would locate, clearly mark and maintain suitable water resource protection boundaries including Streamside Management Zones (SMZ's), Riparian Management Zones (RMZ's) and Wetland Management Zones (WMZ's) adjacent to streams and wetlands consistent with State Forest Land Management Rules and the HCP.

- DNRC will retain trees in the RMZ'S and SMZ's that meet the minimum tree retention requirements of the SMZ Law.

- Mitigations to reduce soil impacts and control erosion on skid trails and cable corridors would be implemented to protect water quality including limiting harvest and hauling operations to periods when soils are relatively dry, (less than 20%), frozen or snow covered to minimize soil compaction and rutting, and maintain drainage features.

- Existing and new roads would be maintained concurrently in association with the harvest and road use activities. Road improvements would include surface blading, rock armoring of culvert inlets, and installation of road drainage features to prevent surface erosion and sediment delivery to streams as needed to comply with BMPS, and to protect water quality.

- All culvert replacements would be completed in accordance with all BMPs and FWP 124 stream permit requirements. Replacement of stream crossing on fish bearing streams would be constructed to provide adequate passage of fish with minimum impact to water quality. Site specific erosion control measures including slash filters, and grass seeding will be implemented during culvert replacements and perennial flows would be diverted from the culvert during construction

- New road construction, including drainage features should be completed in the summer or fall prior to freeze-up or periods of expected high rainfall.

- All newly disturbed soils on road cuts and fills would be promptly reseeded to site adapted grasses to reduce erosion/sediment from roads.

Water & Fishery References

MT DNRC , Environmental Assessments of past DNRC timber sales and road projects including; McNamera T.S., Washoe T.S., Jacko Lake Salvage T.S., Proposed Clearview T.S., Hidden Lakes T.S., DNRC Road projects, and minor salvage permits, Missoula & Clearwater Units, Southwestern Land Office.

MT DNRC. 2003 Montana Administrative Rules for Forest Management on DNRC Forested Lands. Montana DNRC. Trust Lands Management Division. Helena, MT.

Montana DNRC. 2010, 2012 Multiple reports, Montana Forestry Best Management Practice Audit Reports. Forestry Division. Missoula, MT.

MT DNRC. 2010. DNRC Habitat Conservation Plan, Final EIS Forest Management Bureau Division, Missoula, Montana.

MT DNRC, 2011. Best Management Practices for forestry in Montana. Available online at www.dnrc.mt.gov/forestry/assistance/practices/documents/bmp.pdf; Last accessed August 3, 2012.

MT.GOV, 2016, Internet database search MFISH (Montana Fisheries Information System). Montana Fish, Wildlife and Parks, http://fwp.mt.gov/fishing/mFish

MacDonald, L.H., and J.D. Stednick. 2003. Forests and water: A state-of-the-art review for Colorado. Completion report No.196. Colorado Water Resources Research Institute, Fort Collins, CO, 65 pp

NRIS, Montana Natural Resources Information System, Internet database search for water, water rights, and fisheries, 2014. http://nris.state.mt.us/interactive.html

Romme et.al.2006. Recent Forest Insect Outbreaks and fire Risk in Colorado Forests: A brief Synthesis of Relevant Research. CSU Extension.

Stednick, J.D. 1996. Monitoring the effects of timber harvest on annual water yield. Journal of Hydrology 176: 79-95.

Sugden, Brian D., and Scott W. Woods, 2007. Sediment Production From Forest Roads in Western Montana. Journal of the American Water Resources Association (JAWRA) 43(1):193-206.

Missoula Unit
3206 Maverick Lane
Missoula, MT 59804

Persons with disabilities who need an alternative, accessible format of this document should contact the DNRC at the above address.

10 copies of this document were published at an estimated cost of $10.33 per copy.